S
338.31
H3ea

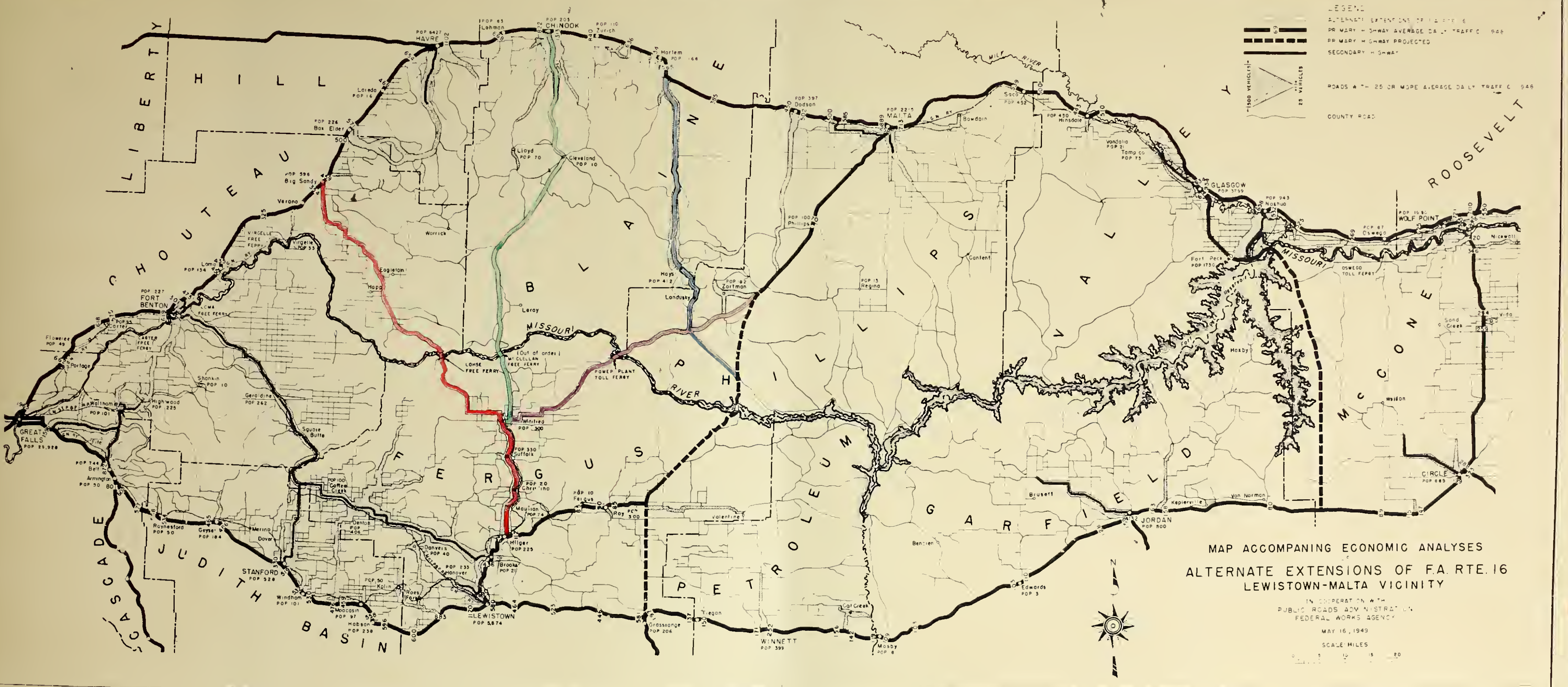
STATE DOCUMENTS

ECONOMIC ANALYSES
OF
ALTERNATE EXTENSIONS OF F.A. ROUTE 16
IN VICINITY OF
LEWISTOWN AND MALTA

PREPARED BY THE
MONTANA HIGHWAY DEPARTMENT
STATE HIGHWAY PLANNING SURVEY
IN COOPERATION WITH
PUBLIC ROADS ADMINISTRATION
FEDERAL WORKS AGENCY

MAY 1949

Montana State Library
3 0864 1006 4217 5



MAP ACCOMPANING ECONOMIC ANALYSES
OF
ALTERNATE EXTENSIONS OF F.A. RTE. 16
LEWISTOWN-MALTA VICINITY

IN COOPERATION WITH
PUBLIC ROADS ADMINISTRATION
FEDERAL WORKS AGENCY

MAY 16, 1949

Digitized by the Internet Archive
in 2013

http://archive.org/details/preliminaryecono01mont

PRELIMINARY ECONOMIC ANALYSES OF EIGHT ALTERNATE ROUTES
BETWEEN F.A. ROUTES 1 and 15
IN VICINITY OF MALTA AND LEWISTOWN

FOREWORD

This report has been prepared for the purpose of comparing the relative merit of eight possible north-south route connections in the central part of the State in the general vicinity between Lewistown and Malta. In analyzing the merit of each route the following formula was used:

$$Qc - 0.707\ (Qs \not- Qbf\ (1-K_2K_3))$$

Qc - Composite quotient
Qs - Ratio of income to annual costs
Qbn - Ratio of non-fuel benefits to annual costs
Qbf - Ratio of fuel benefits to annual costs
$1-K_2K_3$ - Loss of fuel tax through fuel savings to motorists

In simpler terms, this formula weighs the anticipated revenue from the route and the benefits to the motorists against the estimated cost of constructing and maintaining the route to determine whether a favorable balance exists. The route having the highest composite quotient (Qc) is the route with the most favorable standing and should be selected in determining the location of a route through this region. The formula shown above determines the economic solvency of the route; however, it does not determine whether the route is financially solvent, i.e., whether the financial status of the State Highway Department will justify construction on the route selected. Generally speaking the Highway Department must receive sufficient revenue from a route to pay for the costs of constructing and maintaining the route in order to maintain solvency; however, every route cannot meet this requirement, since many routes provide great benefits for the motorist that outweigh the revenue requirement. Also, certain Primary routes in the State carrying high traffic produce a surplus of revenue that can be used to meet the revenue deficiencies of lower traffic routes. Further subsidy is available from fuel tax paid by vehicles operating on county roads and city streets not located on any State highway system. Therefore, a point of balance must be selected where the combination of revenue and benefits in the foregoing formula would be sufficient to justify construction of the route. An analysis of the expected revenue and expenditures of the State Highway Department in the coming years was made in order to determine what modification of this formula was necessary in order to determine financial solvency. The following is the revised formula:

$$Qm - 0.474\ (0.707\ (Qs + Qbn + Qbf\ (1-K_2K_3))$$

-- wherein Qm denotes financial solvency for Montana

Any of the routes having a Qm ratio greater than 1.0000 can be considered financially solvent under this analysis.

DESCRIPTION OF ROUTES

The following are descriptions of the various routes under consideration:

1. Lewistown-Winifred-Malta. Extending northward from a connection with F.A. Route No. 15 in Lewistown through Winifred, across the Missouri River in the vicinity of the Power Plant Ferry, then northeasterly through Phillips to Malta. Length - 147.5 miles.

2. Lewistown-Winifred-Harlem. Along the same route as Alternate 1 to the vicinity of Zortman, thence across the Little Rockies to Hays and then north to a connection with F.A. Route 1 near Harlem. Length - 145.0 miles.

3. Lewistown-Winifred-Chinook. Along the same alignment as Alternate 1 to Winifred, then due north across the Missouri River at the site of the free ferry, then north to Cleveland and then along F.A.S. Route 240 to Chinook. Length - 135.0 miles.

4. Lewistown-Winifred-Big Sandy. Along the same alignment as Alternate 1 to Winifred, then northwesterly along county roads to present free ferry site near mouth of Judith River, then northwesterly along county road to a junction with F.A.S. Route 351, thence to Big Sandy. Length - 110.0 miles.

5. Lewistown-Roy-Malta. Northeasterly along the present alignment of F. A. Route 43 from Lewistown to Roy, then north across the Missouri River near Rocky Point ferry site, then north to a connection with the present construction on F. A. Route 16 south of Malta and north into Malta. Length - 132.5 miles.

6. Lewistown-Roy-Harlem. Along the same alignment as Alternate 5 to a point in the vicinity of Zortman, then north over the Little Rockies to Hays and north to a junction with F. A. Route 1 near Harlem. Length - 138.5 miles.

7. Grass Range-Malta. North from a junction with F. A. Route 15 near Grass Range to a junction with F. A. Route 43 near Roy, then north along the same alignment as Alternate Route 5. Length - 108.2 miles.

8. Grass Range-Harlem. North from a junction with F. A. Route 15 near Grass Range to a junction with F. A. Route 43 near Roy, then north along the same alignment as Alternate Route 6. Length - 114.2 miles.

The map in the frontispiece shows the location of each route, together with railroads, towns, rivers, and other points of interest.

GENERAL DESCRIPTION OF AREA

The general area to be crossed by these routes may be roughly divided into three zones. The first zone extends north from F. A. Route No. 15 to a point about two-thirds of the distance to the

Missouri River. This region is well developed and well populated. It is adequately served by all-weather roads and two railroads. The land is principally devoted to dry farming and good crops are received in years of normal rainfall. There is also considerable livestock raising combined with the farming .

The second zone extends northward across the Missouri River to the Little Rockies and Bear Paw ranges. This land has little economic value and is very sparsely populated. The Missouri River has carved a channel through the region with an approximate depth of 500 feet. The numerous tributaries flowing into the river have carved a series of gullies on both sides of the rivers, and since the earth and rock is easily eroded, the result is an area of badlands. The soil is of the poorest quality and the land is suitable only for very light grazing.

The third zone extends north from the mountain ranges and is fairly well developed. The land is devoted about equally to grazing and dry farming, with the exception of some irrigated areas in the vicinity of the Milk River near F.A. Route 1. A gold mining district is located in the vicinity of Zortman and Landusky which was very active before the turn of the century. The activity dwindled for a number of years; however, there has been a revival here recently and some traffic develops from this region.

Generally speaking, there will be very little local traffic to be served by any of these routes through the central zone, and it is doubtful that a main highway through the region will assist materially in the development of this zone.

The Fort Belknap Indian Reservation includes a large area of land south of Harlem. This reservation is composed mostly of Indian land, although it contains some patented land owned by whites. St. Paul and Hays are two small towns in the southern part of the reservation that comprise a small populated area of interest.

The region southeast of Big Sandy toward the Missouri River is quite well developed, especially toward the Bear Paw Mountains, where dry land grain farms predominate. The foothills provide good grazing for livestock ranches.

TRAFFIC AND REVENUE

North-south routes through this general region will serve two main classes of traffic. There is a small amount of local traffic developing within the north and south zones of the region where the land is well settled and populated. These areas would best be served by local secondary roads rather than by primary through routes since there is very little local traffic to be served in the central zone.

There is a large amount of through traffic that would be served by a primary route that would provide a cut-off for the traffic that goes south from Havre, Harlem, Malta and Glasgow, and north from Miles City, Billings, Livingston, Bozeman, Lewistown and the other large towns in the southern part of the State. At present the traffic between these points must travel longer distances through Great Falls and Wolf Point in order to reach their destinations in the central part of the State. It is principally to serve this through traffic that a highway would be constructed through this region. At present the Missouri River is unbridged from Fort Benton to Fort Peck, a distance of about 250 miles.

The amount of local traffic on each route was determined from traffic counts taken in 1948. It is felt that these local motorists would increase the frequency of their trips if an oiled surface road were to be constructed in place of present low type county roads; therefore, traffic on county roads has been expanded 50% to arrive at the estimated local traffic on primary routes. This 50%

increase was not applied to traffic on the present constructed sections on primary routes since there would be no incentive to increase the amount of travel. It is further estimated that there will be a 37% increase in traffic by 1968 which would give an average of 18% increase during the twenty year period that the construction costs are to be amortized. This 18% was applied to all traffic using the route.

As stated before, a route through this region would provide the greatest benefit to the through traffic between the north central and south central sections of the State. By comparing the distance that motorists in this region have to travel over the present routes with the distance they would travel over the proposed routes, it is possible to define the limits of the zone within which motorists would benefit by using the proposed routes. Roughly speaking, this zone extends southward from Glasgow through Jordan, Miles City and Alzada in the eastern section of the State. The western limit was similarly defined along a line extending from a point about 40 miles west of Havre, through Stanford, Three Forks, Virginia City and south. The traffic within this zone that would benefit from using any individual route is further limited according to the location of the proposed route in the central section of the State, and the origin and destination of the traffic using the route.

Origin-destination surveys were made during the summer of 1948 at Billings, Bozeman, Lewistown and Havre, and from the information obtained through interviews with motorists at these points it was determined which motorists would benefit from using any of the alternate routes. The results of the origin-destination surveys were supported and verified by a separate survey wherein short counts were taken at all county line crossings throughout the State on the primary system. By determining the origin of the vehicle at these counts according to county license numbers, it was possible to estimate the amount of traffic that would have saved time and mileage by using one of the proposed routes. These two surveys were in substantial agreement, and any minor discrepancies were adjusted by averaging the results of the two surveys. These surveys revealed that the main flow of through traffic was from Havre to Billings and vice versa. A secondary traffic flow was from Billings to Malta.

The amount of estimated traffic, both local and through, that would be developed over each of the alternate routes is shown in the following table:

ESTIMATED TRAFFIC ON ALTERNATE ROUTES

Route	Average Daily Present Traffic		Average Daily Traffic Expanded-1948-1968		
	Local	Through	Local	Through	Total
Lewistown-Winifred-Malta	106	65	145	78	223
Lewistown-Winifred-Harlem	99	66	147	77	224
Lewistown-Winifred-Chinook	102	117	151	138	289
Lewistown-Winifred-Big Sandy	128	125	188	148	336
Lewistown-Roy-Malta	99	96	118	113	231
Lewistown-Roy-Harlem	82	78	107	91	198
Grass Range-Malta	38	100	51	118	169
Grass Range-Harlem	25	78	44	91	135

It might appear, at first thought, that the Lewistown-Winifred-Big Sandy route would be the most favorable route since it would serve the most traffic; however, other factors must be considered in determining the over-all merit of each route. For instance, diverted traffic would save 135 miles by using the Grass Range-Harlem route and 113 miles on the Grass Range-Malta route, as compared with sixty-four miles on the Lewistown-Winifred-Big Sandy route. As pointed out later in the report, the greater benefits and lower construction and maintenance costs on other routes have a tendency to outweigh the high traffic on the Lewistown-Winifred-Big Sandy route.

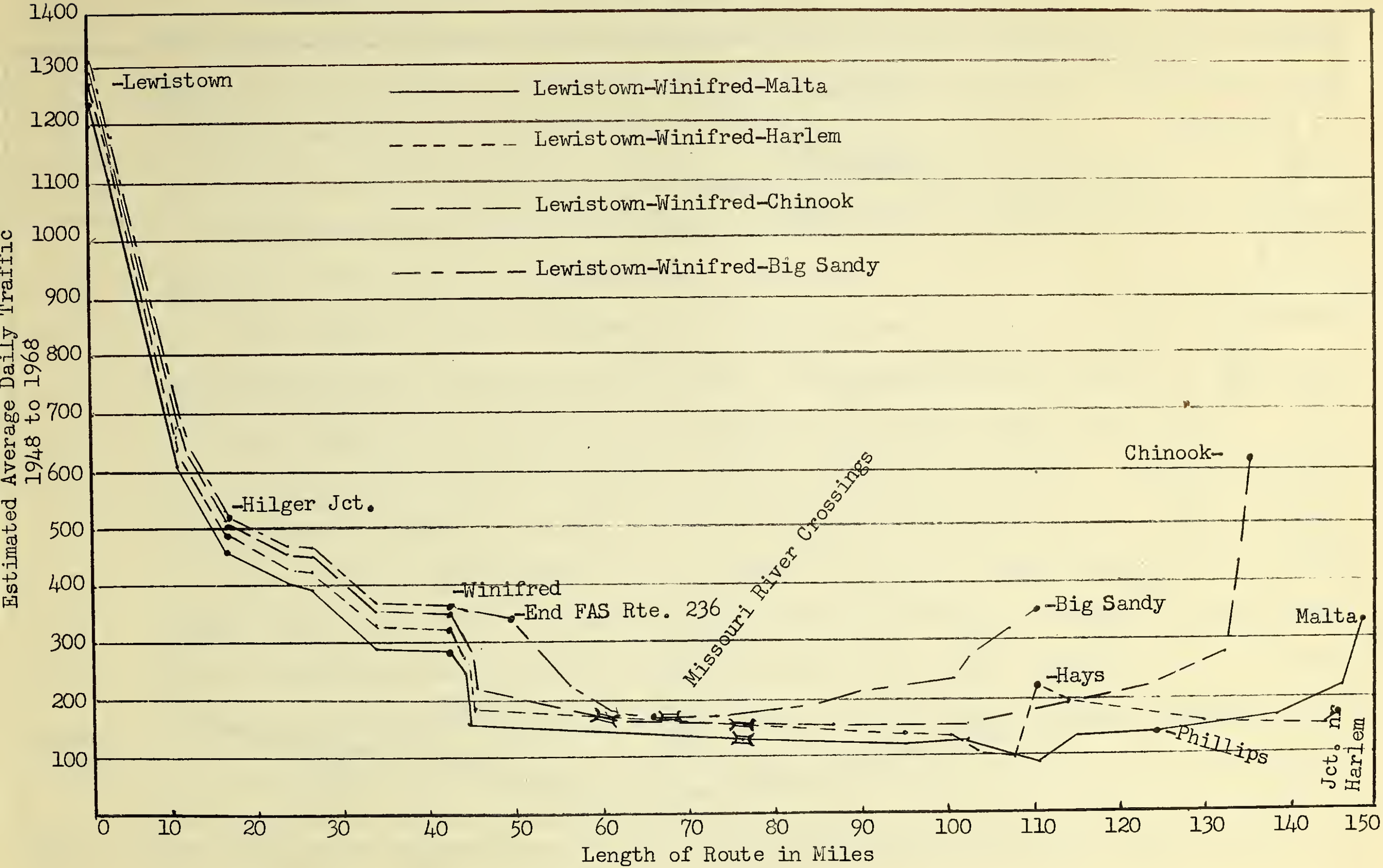
Traffic profiles for each route are shown in the accompanying tables. It will be noted there that the routes through Winifred and Roy carry a very heavy local traffic for a short section of road north of Lewistown which raises the general level of all of the routes leading out of Lewistown. The sections of the routes crossing the Missouri River have a relatively low traffic load, practically all of which is through traffic. As the routes approach the northern termini, the local traffic increases as the land becomes more developed.

Computations covering the amount of revenue to be received from traffic over each route are contained in Tables la to lp in the appendix. It should be noted that revenue from diverted through traffic is not included in the final analysis since this revenue is drained from existing routes and would have the effect of robbing existing routes for the benefit of the proposed routes.

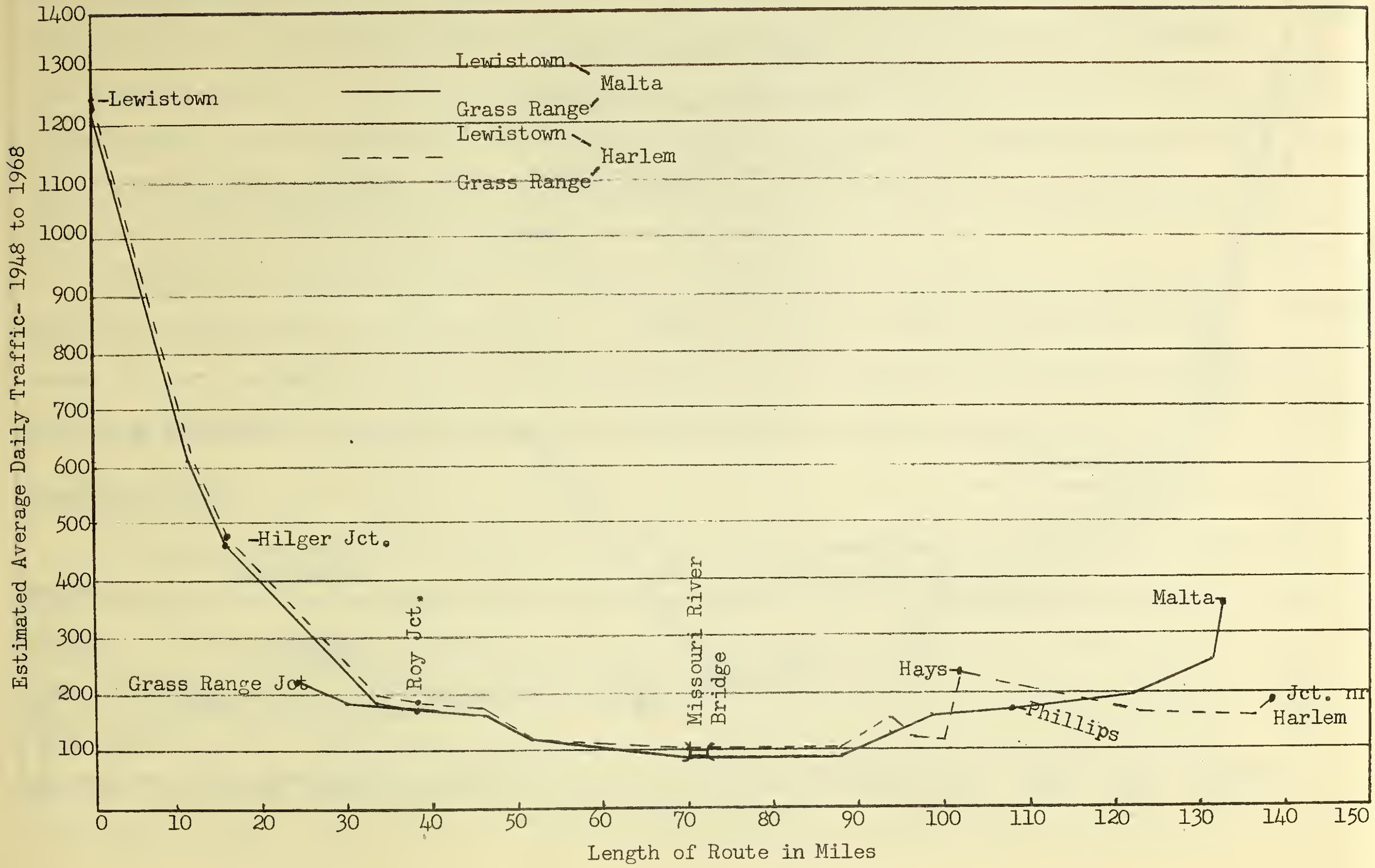
CONSTRUCTION COSTS

Crossing of the Missouri River will require construction of a major bridge structure at one of four possible sites. Routes leading north from Grass Range and Roy will require construction of an 820 foot steel truss bridge at the location of the old Rocky Point Ferry near Wilder. The south approach to this bridge is quite gradual as it follows an old drainage area, and with the exception of a steep bluff next to the river no special problems should be encountered in the south approach. The north approach is quite steep and will require considerable rock excavation. Present maps show that the maximum flow line of the Fort Peck reservoir will extend above this bridge site; however, later

Profile of Estimated Traffic on Alternate Routes Through Region



Profile of Estimated Traffic on Alternate Routes Through Region



information received by the bridge department shows that the flow line will not reach the site and special clearance will not be necessary. The cost of the bridge at this location is estimated at $700,000.00.

A steel truss bridge with a length of 750 feet will be required at the Power Plant Ferry site north of Winifred for those routes leading to Malta and Harlem. The approaches to the bridge at this point are very steep from both sides and will involve heavy excavation. This bridge could be built at an estimated cost of $750,000.00.

The road north from Winifred to Chinook will require a bridge at the McClellan site. This is a very poor site, and although the bridge itself will cost an estimated $650,000.00, the road approaches to the bridge are going to be quite expensive.

The bridge on the route from Winifred to Big Sandy would be located at approximately the same point as the present county ferry on this route. The approaches are quite gradual and there is a fairly good road leading to the site. The estimated cost of this bridge is $600,000.00.

Detailed construction costs for each roadway and bridge are included in Tables 2a to 2h in the appendix. In computing the costs of the roadway over each route, it was considered that the anticipated traffic would require a 28 foot roadway with a 24 foot surface of 2" road mix for the entire length of all routes. The present construction south of Malta and north of Lewistown would require some widening and probable resurfacing and these costs were included along with the new construction involved. The construction north from Roy to Zortman will be through a primitive area and will be on completely new alignment. The road north from Winifred to Zortman will follow much the same alignment as present Montana Route No. 19, and it is probable that portions of the present roadway may be salvaged. The route north from Winifred to Chinook will be over primitive area as far north as

Cleveland and then should follow much of the present alignment of F.A.S. Route 240 from Cleveland to Chinook. The route from Winifred to Big Sandy should follow the present alignment of the county road through this region, and it should be possible to salvage portions of the present roadbed. The routes from Malta south and Big Sandy south skirt along the edges of the Little Rockies range and the Bear Paw range; therefore no mountain crossings will be required. The route to Harlem will require a crossing of the Little Rockies at an elevation of about 5,000 feet. The Chinook route will have crossings over two ridges of the Bear Paws at an approximate elevation of 6,000 feet. All construction costs are computed at present price levels which are believed to be at their peak. Future construction costs should be somewhat lower.

BENEFITS TO MOTORISTS

Benefits that the motorist will receive through construction of a standard highway play a large part in the selection of any of these routes. The motorist will benefit through shortened distances, better alignment and grades, improved roadway surfaces, etc. All of these factors result in fuel savings, wear and tear savings on the vehicle and time savings to the motorist. Monetary values have been assigned to these savings and detailed computations of the total value to the motorists are included in Tables 3a to 4p in the appendix.

The greatest benefit to the local motorist will result from roadway improvement since there will be very little shortening of the routes in the northern and southern stretches of the routes. The through motorist will benefit greatly through distance savings which in some instances will amount to a 36% saving in mileage by traveling over the proposed route. This results in a great time saving and fuel saving for the diverted traffic that finds it advantageous to use the cut-off route.

SUMMARY

As stated in the foreword, this report has the purpose of determining the relative position of the various routes with respect to anticipated revenue from fuel tax received from traffic over the routes, benefits received by the motorists through improved roadway surfaces, shortened distances, etc., and the estimated cost of constructing and maintaining the routes. The revenue, non-fuel benefits, and fuel benefits for each route are compared with the construction and maintenance costs and the ratio is determined for each. These individual ratios are then combined into a formula which results in a composite solvency quotient for each route, the route having the highest composite solvency quotient being the most favorable route. The results are contained in the accompanying table showing the relative standing of the routes.

It will be noted that the Grass Range-Malta route has the highest solvency quotient (Qc), which is equal to 1.4340, i.e., this route has combined revenue and benefit expectations equal to 143.40% of the cost of constructing and maintaining the route. From the standpoint of the State Highway Department alone, this route would be next to the least favorable inasmuch as the annual revenue from the traffic on the route would pay for only 6% of the annual costs of the route, as is shown on the Qs ratio. From the standpoint of the motorist the benefits that he would receive would be equal to 207% of the costs pertaining to the route. It is these greater benefits to the motorist that places this route in the most favorable position.

This route also has the advantage that it is the shortest route and would require less capital outlay. It also preserves the investment that has already been made in construction in the Malta south and Roy north sections.

- COMPARISON OF RESULTS OF ECONOMIC ANALYSES -

Comparison of Annual Costs to Annual Revenue and Benefits

Ratios	Lewistown Winifred Malta	Lewistown Winifred Harlem	Lewistown Winifred Chinook	Lewistown Winifred Big Sandy	Lewistown Roy Malta	Lewistown Roy Harlem	Grass Range to Malta	Grass Range to Harlem
Qs--Revenue / Costs	.1665	.1495	.1577	.2085	.1518	.1185	.0629	.0463
QBn-Non Fuel Benefits / Costs	.8866	.8443	1.2203	1.3250	1.0426	.9983	1.4830	1.2417
QBf-Fuel Benefits / Costs	.3442	.3338	.4892	.5166	.4190	.3876	.5905	.4817
Qc--Combined Revenue & Benefits/ Costs	.9574	.9124	1.2756	1.4037	1.0957	1.0288	1.4340	1.1922

Comparison of Traffic Served and Construction Costs

Missouri River Bridge Construction Costs*	866,250	866,250	750,750	693,000	808,500	808,500	808,500	808,500
Roadway Construction Costs*	5,709,765	6,533,692	6,361,133	4,512,459	4,212,286	5,404,973	3,878,030	5,061,188
Roadway Costs Per Mile*	38,710	45,060	47,120	41,022	31,790	39,025	35,841	44,319
Ton Miles of Traffic Served	37,850,270	38,411,295	41,726,610	38,831,540	32,571,945	31,993,827	20,146,840	20,947,821
% of Through Traffic to Total Traffic	40.92	41.71	46.06	42.65	50.86	52.36	70.38	71.12

*Includes engineering, administration and contingencies

The construction costs contained in these analyses are based on the premise that the complete cost of construction would be borne by the State Highway Department. Federal-aid participation at the current rate in these construction costs would reduce the net construction costs, and consequently would raise proportionately the solvency quotients for all of the routes. In the case of the Grass Range-Malta route, the composite solvency quotient would be raised from 1.4340 to 2.7762.

When the Qc ratio is multiplied by the 0.474 "financial solvency factor" in order to determine the financial solvency of the route, the result is 1.3159. Since a Qm ratio of 1.0000 indicates solvency, the results of this analysis show that the State Highway Department would be justified in constructing this route.

The route from Grass Range to Malta would provide adequate service for the through traffic, leaving the local traffic in the remainder of the region to be considered. The present secondary routes from Chinook south, Big Sandy south, and from Lewistown to Winifred will provide adequate all-weather service for the residents in these regions when they are constructed to standard. The residents from Lewistown to Roy already have F.A. Route 43 to serve them. The traffic profiles show that there is a small population area around Zortman, Landusky, St. Pauls and Hays that is not served by any State highway system. It is believed that some consideration should be given in the future to designating a secondary route to connect these places with the Grass Range-Malta route.

RECOMMENDATIONS

It is recommended that the present designation of F.A. Route 16 from Grass Range to Malta be retained on the primary system.

APPENDIX

TABLE NO. 1a

MONTANA HIGHWAY PLANNING SURVEY

HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Malta Route **Counties** Fergus, Phillips

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948- 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	53.10	56.17	77.15	28,160	1.55	43,648	147.5	6,438,080	0.002188	14,086
Pass. Cars, Foreign	4.95	5.23	7.19	2,624	1.55	4,067	"	599,882	0.001779	1,067
Total Passenger Cars	58.05	61.40	84.34	30,784	1.55	47,715	"	7,037,962	---	15,153
Trucks, light	30.49	32.25	44.30	16,170	3.30	53,361	"	7,870,747	0.003248	25,564
Trucks, medium	10.37	10.96	15.06	5,497	7.31	40,183	"	5,926,992	0.002382	14,118
Trucks, heavy					10.73		"		0.001619	
Trucks, semi-trailer	.38	.41	.56	204	14.17	2,891	"	426,422	0.001543	658
Trucks, full-trailer	.65	.69	.95	347	20.60	7,148	"	1,054,331	0.001396	1,472
Busses	.06	.06	.08	32	9.00	288	"	42,481	0.001873	79
Total Commercial	41.95	44.37	60.95	22,250	Average 4.67	103,871	"	15,320,973	0.002734	41,891
Total All Vehicles	100.00	105.77	145.29	53,034	Average 2.86	151,586	"	22,358,935	0.002551	57,044
								Increased to 6¢ gasoline tax		$68,453

TABLE NO. 1b

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Harlem Route **Counties** Fergus, Blaine

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	**%**	**Vehicles1948-**		**Annual Vehicles Col. 3x365**	**Tons Per Veh.**	**Annual Tons**	**Route Miles**	**Ton Miles**	**Dollars Per Ton Mile**	**Dollars Tot. Ann. Net. Rev.**
		1948 A.D.T.	**1968 A.D.T.**							
Passenger Cars, Mont.	57.27	56.59	84.25	30,751	1.55	47,664	145.0	6,911,280	0.002188	15,122
Pass. Cars; Foreign	5.12	5.06	7.53	2,748	1.55	4,259	"	617,555	0.001779	1,098
Total Passenger Cars	62.39	61.65	91.78	33,499	1.55	51,923	"	7,528,835	---	16,220
Trucks, light	21.50	21.25	31.63	11,545	3.30	38,098	"	5,524,210	0.003248	17,943
Trucks, medium	15.81	15.62	23.26	8,490	7.31	62,062	"	8,998,990	0.002382	21,435
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	.18	.18	.26	94	14.17	1,332	"	193,140	0.001543	298
Trucks, full-trailer	.06	.06	.09	33	20.60	680	"	98,600	0.001396	137
Busses	.06	.06	.09	33	9.00	297	"	43,065	0.001873	80
Total Commercial	37.61	37.17	55.33	20,195	Average 5.07	102,469	"	14,858,005	0.002685	39,893
Total All Vehicles	100.00	98.82	147.11	53,694	Average 2.87	154,392	"	22,386,840	0.002506	56,113

Increased to 6¢ gasoline tax $67,335

TABLE NO. 1c

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Chinook Route **Counties** Fergus, Blaine

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948- 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Total Ann. Net. Rev.
Passenger Cars, Mont.	53.02	54.15	79.93	29,174	1.55	45,220	135.0	6,104,700	0.002188	13,357
Pass. Cars, Foreign	4.85	4.95	7.31	2,668	1.55	4,135	"	558,225	0.001779	993
Total Passenger Cars	57.87	59.10	87.24	31,842	1.55	49,355	"	6,662,925	---	14,350
Trucks, light	24.77	25.31	37.34	13,629	3.30	44,976	"	6,071,760	0.003248	19,721
Trucks, medium	16.71	17.06	25.19	9,194	7.31	67,208	"	9,073,080	0.002382	21,612
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	.51	.52	.77	282	14.17	3,996	"	539,460	0.001543	832
Trucks, full-trailer	.07	.07	.11	40	20.60	824	"	111,240	0.001396	155
Busses	.07	.07	.11	40	9.00	360	"	48,600	0.001873	91
Total Commercial	42.13	43.03	63.52	23,185	Average 5.06	117,364	"	15,844,140	0.002677	42,411
Total All Vehicles	100.00	102.13	150.76	55,027	Average 3.03	166,719	"	22,507,065	0.002520	56,761

Increased to 6¢ gasoline tax $68,113

TABLE NO. 1d

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Big Sandy Route **Counties** Fergus, Chouteau

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948- 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	55.10	70.46	103.48	37,770	1.55	58,543	110.0	6,439,730	0.002188	14,090
Pass. Cars, Foreign	5.38	6.88	10.10	3,687	1.55	5,714	"	628,540	0.001779	1,118
Total Passenger Cars	60.48	77.34	113.58	41,457	1.55	64,257	"	7,068,270	---	15,208
Trucks, light	23.34	29.85	43.85	16,002	3.30	52,807	"	5,808,770	0.003248	18,867
Trucks, medium	15.40	19.70	28.92	10,556	7.31	77,164	"	8,488,040	0.002382	20,218
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	.60	.76	1.13	412	14.17	5,838	"	642,180	0.001543	991
Trucks, full-trailer	.09	.12	.22	80	20.60	1,648	"	181,280	0.001396	253
Busses	.09	.12	.22	80	9.00	720	"	79,200	0.001873	148
Total Commercial	39.52	50.55	74.23	27,094	Average 5.10	138,177	"	15,199,470	0.002663	40,477
Total All Vehicles	100.00	127.89	187.81	68,551	Average 2.95	202,434	"	22,267,740	0.002500	55,685

Increased to 6¢ gasoline tax $66,822

TABLE NO. 1e

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Roy-Malta Route **Counties** Fergus, Phillips

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948		Annual Vehicles Col. 3x 365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot$ Ann. Net. Rev.
		1948 A.D.T.	1968 A.D.T.							
Passenger Cars, Mont.	53.99	53.75	63.87	23,313	1.55	36,135	132.5	4,787,888	0.002188	10,476
Pass. Cars, Foreign	4.67	4.65	5.53	2,018	1.55	3,128	"	414,460	0.001779	737
Total Passenger Cars	58.66	58.40	69.40	25,331	1.55	39,263	"	5,202,348	---	11,213
Trucks, light	31.06	30.92	36.74	13,410	3.30	44,253	"	5,863,522	0.003248	19,045
Trucks, medium	9.17	9.13	10.86	3,964	7.31	28,977	"	3,839,452	0.002382	9,146
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	.41	.41	.48	175	14.17	2,480	"	328,600	0.001543	507
Trucks, full-trailer	.63	.63	.74	270	20.60	5,562	"	736,965	0.001396	1,029
Busses	.07	.07	.08	29	9.00	261	"	34,582	0.001873	65
Total Commercial	41.34	41.16	48.90	17,848	**Average** 4.57	81,533	"	10,803,122	0.002758	29,792
Total All Vehicles	100.00	99.56	118.30	43,179	**Average** 2.80	120,796	"	16,005,470	0.002562	41,005

Increased to 6¢ gasoline tax $49,206

TABLE NO. 1f

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Roy-Harlem Route **Counties** Fergus, Blaine

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	**%**	**Vehicles 1949**		**Annual Vehicles Col. 3x365**	**Tons Per Veh.**	**Annual Tons**	**Route Miles**	**Ton Miles**	**Dollars Per Ton Mile**	**Dollars Tot$ Ann. Net. Rev.**
		1948 A.D.T.	**1968 A.D.T.**							
Passenger Cars, Mont.	58.24	47.77	62.40	22,776	1.55	35,303	138.5	4,889,466	0.002188	10,698
Pass. Cars; Foreign	4.83	3.96	5.18	1,891	1.55	2,931	"	405,943	0.001779	722
Total Passenger Cars	63.07	51.73	67.58	24,667	1.55	38,234	"	5,295,409	---	11,420
Trucks, light	22.16	18.18	23.74	8,665	3.30	28,594	"	3,960,269	0.003248	12,863
Trucks, medium	14.43	11.83	15.46	5,643	7.31	41,250	"	5,713,125	0.002382	13,609
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	.20	.16	.21	77	14.17	1,091	"	151,104	0.001543	233
Trucks, full-trailer	.07	.06	.08	29	20.60	597	"	82,684	0.001396	115
Busses	.07	.06	.08	29	9.00	261	"	36,148	0.001873	68
Total Commercial	36.93	30.29	39.57	14,443	**Average** 4.97	71,793	"	9,943,330	0.002704	26,888
Total All Vehicles	100.00	82.02	107.15	39,110	**Average** 2.81	110,027	"	15,238,739	0.002514	38,308

Increased to 6¢ gasoline tax $45,970

TABLE NO. 1g

MONTANA HIGHWAY PLANNING SURVEY

HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Grass Range-Malta Route **Counties** Fergus, Phillips

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 48		Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
		1948 A.D.T.	1968 A.D.T.							
Passenger Cars, Mont.	50.12	19.20	25.39	9,267	1.55	14,364	108.2	1,554,185	0.002188	3,400
Pass. Cars, Foreign	4.84	1.85	2.45	894	1.55	1,386	"	149,965	0.001779	267
Total Passenger Cars	54.96	21.05	27.84	10,161	1.55	15,750	"	1,704,150	---	3,667
Trucks, light	32.56	12.47	16.49	6,019	3.30	19,863	"	2,149,177	0.003248	6,980
Trucks, medium	11.12	4.26	5.63	2,055	7.31	15,022	"	1,625,380	0.002382	3,872
Trucks, heavy	.22	.08	.11	40	10.73	429	"	46,417	0.001619	75
Trucks, semi-trailer	.23	.09	.12	44	14.17	623	"	67,409	0.001543	104
Trucks, full-trailer	.91	.35	.46	168	20.60	3,461	"	374,480	0.001396	523
Busses					9.00				0.001873	
Total Commercial	45.04	17.25	22.81	8,326	Average 4.73	39,398	"	4,262,863	0.002710	11,554
Total All Vehicles	100.00	38.30	50.65	18,487	Average 2.98	55,148	"	5,967,013	0.002551	15,221

Increased to 6¢ gasoline tax $18,265

TABLE NO. 1h

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Grass Range-Harlem Route **Counties** Fergus, Blaine

Existing and Internal Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	**%**	**Vehicles 1948**		**Annual Vehicles Col. 3x365**	**Tons Per Veh.**	**Annual Tons**	**Route Miles**	**Ton Miles**	**Dollars Per Ton Mile**	**Dollars Tot. Ann. Net. Rev.**
		1948 A.D.T.	**1968 A.D.T.**							
Passenger Cars, Mont.	55.68	13.85	24.52	8,950	1.55	13,873	114.2	1,584,297	0.002188	3,466
Pass. Cars, Foreign	5.02	1.25	2.21	807	1.55	1,251	"	142,864	0.001779	254
Total Passenger Cars	60.70	15.10	26.73	9,757	1.55	15,124	"	1,727,161	---	3,720
Trucks, light	21.74	5.41	9.57	3,493	3.30	11,527	"	1,316,383	0.003248	4,276
Trucks, medium	17.16	4.27	7.56	2,759	7.31	20,168	"	2,303,186	0.002382	5,486
Trucks, heavy	.20	.05	.09	33	10.73	354	"	40,427	0.001619	65
Trucks, semi-trailer					14.17				0.001543	
Trucks, full-trailer	.20	.05	.09	33	20.60	680	"	77,656	0.001396	108
Busses					9.00				0.001873	
Total Commercial	39.30	9.78	17.31	6,318	**Average** 5.18	32,729	"	3,737,652	0.002658	9,935
Total All Vehicles	100.00	24.88	44.04	16,075	**Average** 2.98	47,853	"	5,464,813	0.002499	13,655

Increased to 6¢ gasoline tax $16,386

TABLE NO. 1i

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Malta Route **Counties** Fergus, Phillips

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948		Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
		1948 A.D.T.	1968 A.D.T.							
Passenger Cars, Mont.	26.15	17	20	7,300	1.55	11,315	147.5	1,668,963	0.002188	3,652
Pass. Cars, Foreign	32.31	21	25	9,125	1.55	14,144	"	2,086,240	0.001779	3,712
Total Passenger Cars	58.46	38	45	16,425	1.55	25,459	"	3,755,203	---	7,364
Trucks, light	29.24	19	22	8,030	3.30	26,499	"	3,908,602	0.003248	12,695
Trucks, medium	4.61	3	4	1,460	7.31	10,673	"	1,574,267	0.002382	3,750
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	4.61	3	4	1,460	14.17	19,838	"	2,926,105	0.001543	4,515
Trucks, full-trailer	3.08	2	3	1,095	20.60	22,557	"	3,327,158	0.001396	4,645
Busses					9.00				0.001873	
Total Commercial	41.54	27	33	12,045	Average 6.60	79,567	"	11,736,132	0.002181	25,605
Total All Vehicles	100.00	65	78	28,470	Average 3.69	105,026	"	15,491,335	0.002128	32,969

Increased to 6¢ gasoline tax $39,563

TABLE NO. 1j

MONTANA HIGHWAY PLANNING SURVEY

HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Harlem **Counties** Fergus, Blaine

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col.3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	41.05	39	46	16,790	1.55	26,024	145.0	3,773,480	0.002188	8,256
Pass. Cars, Foreign	27.37	26	31	11,315	1.55	17,538	"	2,543,010	0.001779	6,713
Total Passenger Cars	68.42	65	77	28,105	1.55	43,562	"	6,316,490	---	14,969
Trucks, light	20.00	19	22	8,030	3.30	26,499	"	3,842,355	0.003248	12,480
Trucks, medium	6.31	6	7	2,555	7.31	18,677	"	2,708,165	0.002382	6,451
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	3.17	3	4	1,460	14.17	20,688	"	2,999,760	0.001543	4,629
Trucks, full-trailer	2.10	2	2	730	20.60	15,038	"	2,180,510	0.001396	3,044
Busses					9.00				0.001873	
Total Commercial	31.58	30	35	12,775	Average 6.33	80,902	"	11,730,790	0.002268	26,604
Total All Vehicles	100.00	95	112	40,880	Average 3.04	124,464	"	18,047,280	0.002304	41,573
Less: Traffic to Malta		29	35	12,775		56,024	36.1	2,022,465		3,531
Net Traffic to Harlem		66	77	28,105		68,440		16,024,815		38,042
								Increased to 6¢ gasoline tax		$45,650

TABLE NO. 1k

MONTANA HIGHWAY PLANNING SURVEY

HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Chinook Route **Counties** Fergus, Blaine

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948-		Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
		1948 A.D.T.	1968 A.D.T.							
Passenger Cars, Mont.	48.72	57	67	24,455	1.55	37,905	135.0	5,117,175	0.002188	11,196
Pass. Cars, Foreign	22.22	26	31	11,315	1.55	17,538	"	2,367,630	0.001779	4,212
Total Passenger Cars	70.94	83	98	35,770	1.55	55,443	"	7,484,805	---	15,408
Trucks, light	19.66	23	27	9,855	3.30	32,521	"	4,390,335	0.003248	14,260
Trucks, medium	5.13	6	7	2,555	7.31	18,677	"	2,521,395	0.002382	6,006
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	2.56	3	4	1,460	14.17	20,688	"	2,792,880	0.001543	4,309
Trucks, full-trailer	1.71	2	2	730	20.60	15,038	"	2,030,130	0.001396	2,834
Busses					9.00				0.001873	
Total Commercial	29.06	34	40	14,600	Average 5.95	86,924	"	11,734,740	0.002335	27,409
Total All Vehicles	100.00	117	138	50,370	Average 2.83	142,367	"	19,219,545	0.002228	42,817

Increased to 6¢ gasoline tax $51,380

TABLE NO. 11

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Winifred-Big Sandy Route **Counties** Fergus, Chouteau

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	**%**	**Vehicles 1948-**		**Annual Vehicles Col. 3x365**	**Tons Per Veh.**	**Annual Tons**	**Route Miles**	**Ton Miles**	**Dollars Per Ton Mile**	**Dollars Tot. Ann. Net. Rev.**
		1948 A.D.T.	**1968 A.D.T.**							
Passenger Cars, Mont.	49.60	62	73	26,645	1.55	41,300	110.0	4,543,000	0.002188	9,940
Pass. Cars, Foreign	20.80	26	31	11,315	1.55	17,538	"	1,929,180	0.001779	3,432
Total Passenger Cars	70.40	88	104	37,960	1.55	58,838	"	6,472,180	---	13,372
Trucks, light	20.80	26	31	11,315	3.30	37,339	"	4,107,290	0.003248	13,340
Trucks, medium	4.80	6	7	2,555	7.31	18,677	"	2,054,470	0.002382	4,894
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	2.40	3	4	1,460	14.17	20,688	"	2,275,680	0.001543	3,511
Trucks, full-trailer	1.60	2	2	730	20.60	15,038	"	1,654,180	0.001396	2,309
Busses					9.00				0.001873	
Total Commercial	29.60	37	44	16,060	**Average** 5.71	91,742	"	10,091,620	0.002383	24,054
Total All Vehicles	100.00	125	148	54,020	**Average** 2.15	150,580	"	16,563,800	0.002259	37,426

Increased to 6¢ gasoline tax $44,911

TABLE NO. 1m
MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Roy-Malta Route **Counties** Fergus, Phillips

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948 - 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	41.67	40	47	17,155	1.55	26,590	132.5	3,523,175	0.002188	7,708
Pass. Cars, Foreign	27.08	26	31	11,315	1.55	17,538	"	2,323,785	0.001779	4,134
Total Passenger Cars	68.75	66	78	28,470	1.55	44,128	"	5,846,960	---	11,842
Trucks, light	19.79	19	22	8,030	3.30	26,499	"	3,511,175	0.003248	11,404
Trucks, medium	6.25	6	7	2,555	7.31	18,677	"	2,474,705	0.002382	5,895
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	3.12	3	4	1,460	14.17	20,688	"	2,741,160	0.001543	4,230
Trucks, full-trailer	2.09	2	2	730	20.60	15,038	"	1,992,535	0.001396	2,781
Busses					9.00				0.001873	
Total Commercial	31.25	30	35	12,775	Average 6.33	80,902	"	10,719,515	0.002267	24,310
Total All Vehicles	100.00	96	113	41,245	Average	125,030	"	16,566,475	0.002182	36,152
								Increased to 6¢ gasoline tax		$43,382

TABLE NO. 1n

MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Lewistown-Roy-Harlem Route **Counties** Fergus, Blaine

External Diverted Traffic **Date of Analysis** May 16, 1949

Traffic Type	%	Vehicles 1948-1968 1948 A.D.T.	 1968 A.D.T.	Annual Vehicles Col.3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	43.93	47	55	20,075	1.55	31,116	138.5	4,309,566	0.002188	9,429
Pass. Cars, Foreign	24.29	26	31	11,315	1.55	17,538	"	2,429,013	0.001779	4,321
Total Passenger Cars	68.22	73	86	31,390	1.55	48,654	"	6,738,579	---	13,750
Trucks, light	21.49	23	27	9,855	3.30	32,521	"	4,504,158	0.003248	14,629
Trucks, medium	5.61	6	7	2,555	7.31	18,677	"	2,586,764	0.002382	6,162
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	2.80	3	4	1,460	14.17	20,688	"	2,865,288	0.001543	4,421
Trucks, full-trailer	1.88	2	2	730	20.60	15,038	"	2,082,764	0.001396	2,907
Busses					9.00				0.001873	
Total Commercial	31.78	34	40	14,600	Average 5.95	86,924	"	12,038,974	0.002335	28,119
Total All Vehicles	100.00	107	126	45,990	Average 2.94	135,578	"	18,777,553	0.002229	41,869
Less: Traffic to Malta		29	35	12,775		56,024	36.1	2,022,465		3,531
Net Traffic to Harlem		78	91	33,215		79,554		16,755,088		38,338
							Increased to 6¢ gasoline tax			$46,005

TABLE NO. 1-o
MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Grass Range-Malta Route

Counties Fergus, Phillips

External Diverted Traffic

Date of Analysis May 16, 1949

Traffic Type	%	Vehicles 1948- 1948 A.D.T.	Vehicles 1948- 1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	40.00	40	47	17,155	1.55	26,590	108.2	2,877,038	0.002188	6,295
Pass. Cars, Foreign	26.00	26	31	11,315	1.55	17,538	"	1,897,612	0.001779	5,118
Total Passenger Cars	66.00	66	78	28,470	1.55	44,128	"	4,774,650	---	11,413
Trucks, light	23.00	23	27	9,855	3.30	32,521	"	3,518,772	0.003248	11,429
Trucks, medium	6.00	6	7	2,555	7.31	18,677	"	2,020,851	0.002382	4,814
Trucks, heavy					10.73		"		0.001619	
Trucks, semi-trailer	3.00	3	4	1,460	14.17	20,688	"	2,238,442	0.001543	3,454
Trucks, full-trailer	2.00	2	2	730	20.60	15,038	"	1,627,112	0.001396	2,271
Busses					9.00		"		0.001873	
Total Commercial	34.00	34	40	14,600	Average: 5.95	86,924	"	9,405,177	0.002335	21,968
Total All Vehicles	100.00	100	118	43,070	Average: 3.04	131,052	"	14,179,827	0.002354	33,381

Increased to 6¢ gasoline tax $40,057

TABLE NO. 1-p
MONTANA HIGHWAY PLANNING SURVEY
HIGHWAY ECONOMIC ANALYSIS - REVENUE FROM TRAFFIC

Location Grass Range-Harlem Route

External Diverted Traffic

Counties Fergus, Blaine

Date of Analysis May 16, 1949

Traffic Type	%	Vehicles 1948- 1948 A.D.T.	1968 A.D.T.	Annual Vehicles Col. 3x365	Tons Per Veh.	Annual Tons	Route Miles	Ton Miles	Dollars Per Ton Mile	Dollars Tot. Ann. Net. Rev.
Passenger Cars, Mont.	43.92	47	55	20,075	1.55	31,116	114.2	3,553,447	0.002188	7,775
Pass. Cars, Foreign	24.30	26	31	11,315	1.55	17,538	"	2,002,840	0.001779	3,563
Total Passenger Cars	68.22	73	86	31,390	1.55	48,654	"	5,556,287	---	11,338
Trucks, light	21.49	23	27	9,855	3.30	32,521	"	3,713,898	0.003248	12,063
Trucks, medium	5.61	6	7	2,555	7.31	18,677	"	2,132,913	0.002382	5,080
Trucks, heavy					10.73				0.001619	
Trucks, semi-trailer	2.80	3	4	1,460	14.17	20,688	"	2,362,570	0.001543	3,645
Trucks, full-trailer	1.88	2	2	730	20.60	15,038	"	1,717,340	0.001396	2,397
Busses					9.00				0.001873	
Total Commercial	31.78	34	40	14,600	Average: 5.95	86,924	"	9,926,721	0.002335	23,185
Total All Vehicles	100.00	107	126	45,990	Average: 2.94	135,578	"	15,483,008	0.002229	34,523
Less: Traffic to Malta		29	35	12,775		56,024	36.1	2,022,465		3,531
Net Traffic to Harlem		78	91	33,215		79,554		13,460,543		30,992
								Increased to 6¢ gasoline tax		$37,190

Table no. 2-a

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Winfred-Malta Route

Counties Fergus, Phillips

Average Costs per Mile	Sec. A 14.2 mi.	Sec. B 27.3 mi.	Sec. C 52.0 mi.	Sec. D 15.4 mi.	Sec. E 38.6 mi	Total 147.5 mi.	Missouri Bridge
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	20,000	35,000	35,000	35,000	15,000		
Oil surfacing)							
Major drainage structures		380 ft	456 ft	135 ft			
Minor drainage structures							
Rights of way		600	200	200			
Engineering & administration costs							
a. Grade, gravel, oil							
b. 5% of cost of major drainage							
Subtotal							
Plus 10% for contingencies							
Total average cost per mile							
Total Costs for Constructed Miles							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	284,000	955,500	1,820,000	539,000	579,000	4,177,500	
Oil surfacing)							
Major drainage structures		55,100	66,120	19,575		140,795	750,000
Minor drainage structures							
Rights of way		16,380	10,400	3,080		29,860	
Engineering & administration costs							
a. Grade, gravel, oil	56,800	191,100	364,000	107,800	115,800	835,500	
b. 5% of cost of major drainage		2,755	3,306	979		7,040	37,500
Subtotal	340,800	1,220,835	2,263,826	670,434	694,800	5,190,695	787,500
Plus 10% for contingencies	34,080	122,084	226,383	67,043	69,480	519,070	78,750
Total unamortized construction cost	374,880	1,342,919	2,490,209	737,477	764,280	5,709,765	866,250
Annual capital cost Bridge-40 years							21,656
(20 yrs. [illegible]	18,744	67,145	124,510	36,874	38,214	285,488	
Maintenance cost at $ 700 **per mile**	9,940	19,110	36,400	10,780	27,020	103,250	563
Total annual costs	28,684	86,255	160,910	47,654	65,234	388,738	22,219
					Bridge	22,219	
Section:				Total Annual Cost		$410,957	

A- Lewistown-Hilger (Widen & Surface)
B- Hilger-Winifred (New Construction)
C- Winifred-Landusky Jct. (New Constr.)
D- Landusky Jct.-Present Constr.(New Construction)
E- Sec. D to Malta (Widen & Surface)

TABLE NO. 2-b

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Winifred-Harlem Route **Counties** Fergus, Blaine

Average Costs per Mile	Sec. A 14.2 mi.	Sec. B 27.3 mi.	Sec. C 52.0 mi.	Sec. D 15.4 mi.	Sec. E 3.0 mi.	Sec. F 33.1 mi.	Total 145.0 mi.	Missouri Bridge
Grading, clearing, etc.								
Gravel base & surfacing) Combined	20,000	35,000	35,000	35,000	50,000	30,000		
Oil surfacing								
Major drainage structures		380 ft	456 ft.	135 ft.	120 ft.	220 ft.		
Minor drainage structures								
Rights of way		600	200	200	200	600		
Engineering & administration costs								
a. Grade, gravel, oil								
b. 5% of cost of major drainage								
Subtotal								
Plus 10% for contingencies								
Total average cost per mile								
Total Costs for Constructed Miles								
Grading, clearing, etc.								
Gravel base & surfacing) Combined	284,000	955,500	1,820,000	539,000	150,000	993,000	4,741,500	
Oil surfacing								
Major drainage structures		55,100	66,120	19,575	17,400	31,900	190,095	750,000
Minor drainage structures								
Rights of way		16,380	10,400	3,080	600	19,860	50,320	
Engineering & administration costs								
a. Grade, gravel, oil 20%	56,800	191,100	364,000	107,800	30,000	198,600	948,300	
b. 5% of cost of major drainage		2,755	3,306	979	870	1,595	9,505	37,500
Subtotal	340,800	1,220,835	2,263,826	670,434	198,870	1,244,955	5,939,720	787,500
Plus 10% for contingencies	34,080	122,084	226,383	67,043	19,887	124,495	593,972	78,750
Total unamortized construction cost	374,880	1,342,919	2,490,209	737,477	218,757	1,369,450	6,533,692	866,250
Annual capital cost -Bridge (40 yrs.)								21,656
(20 yrs. [illegible])	18,744	67,145	124,511	36,874	10,938	68,472	326,684	
Maintenance cost at $700 **per mile**	9,940	19,110	36,400	10,780	2,100	23,170	101,500	563
Total annual costs	28,684	86,255	160,911	47,654	13,038	91,642	428,184	22,219
						Bridge	22,219	
Section:					Total Annual Cost		$450,403	
A-Lewistown-Hilger (Widen & Surface)								
B-Hilger-Winifred (New Construction)								
C-Winifred-Landusky Jct. (New Constr.)								
D-Jct. to Little Rockies (New Constr.)								
E-Over Little Rockies (New Construction)								
F- Hays to Jct. Rte. 1 (New Constr.)								

TABLE NO. 2-C

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Winifred-Chinook **Counties** Fergus, Blaine

Average Costs per Mile	Sec. A 14.2 mi.	Sec. B 27.3 mi.	Sec. C 20.0 mi.	Sec. D 33.0 mi.	Sec. E 15.0 mi.	Sec. F 25.5 mi.	Total 135.0 mi.	Missouri Bridge
Grading, clearing, etc.)								
Gravel base & surfacing) Combined	20,000	35,000	37,000	35,000	45,000	30,000		
Oil surfacing)								
Major drainage structures		380 ft.	300 ft.	400 ft.	350 ft.	200 ft.		
Minor drainage structures								
Rights of way		600	200	200	200	600		
Engineering & administration costs								
a. Grade, gravel, oil								
b. 5% of cost of major drainage								
Subtotal								
Plus 10% for contingencies								
Total average cost per mile								
Total Costs for Constructed Miles								
Grading, clearing, etc.)								
Gravel base & surfacing) Combined	284,000	955,500	740,000	1,155,000	675,000	765,000	4,574,500	
Oil surfacing)								
Major drainage structures		55,100	43,500	58,000	50,750	29,000	236,350	650,000
Minor drainage structures								
Rights of way		16,380	4,000	6,600	3,000	15,300	45,280	
Engineering & administration costs								
a. Grade, gravel, oil 20%	56,800	191,100	148,000	231,000	135,000	153,000	914,900	
b. 5% of cost of major drainage		2,755	2,175	2,900	2,538	1,450	11,818	32,500
Subtotal	340,800	1,220,835	937,675	1,453,500	866,288	963,750	5,782,848	682,500
Plus 10% for contingencies	34,080	122,084	93,768	145,350	86,628	96,375	578,285	68,250
Total unamortized construction cost	374,880	1,342,919	1,031,443	1,598,850	952,916	1,060,125	6,361,133	750,750
Annual capital cost-Bridge (40 yrs.)								18,769
(20 yrs.	18,744	67,145	51,572	79,942	47,645	53,006	318,054	
Maintenance cost at $700 **per mile**	9,940	19,110	14,000	23,100	10,500	17,850	94,500	550
Total annual costs	28,684	86,255	65,572	103,042	58,145	70,856	412,554	19,319
						Bridge	19,319	
Section:					Total Annual Cost		$431,873	
A-Lewistown-Hilger (Widen & Surface)								
B-Hilger-Winifred (New Construction)								
C-Winifred-10 mi. N River (New Constr.)								
D-Sec. C to Bear Paws (New Constr.)								
E-Over Bear Paws (New Construction)								
F- Cleveland-Chinook (New Constr.)								

TABLE NO. 2-d

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Winifred-Big Sandy Route

Counties Fergus, Chouteau

	Sec. A 14.2 mi.	Sec. B 27.3 mi.	Sec. C 68.5 mi.	Total 110.0 mi.	Missouri Bridge		
Average Costs per Mile							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	20,000	35,000	30,000				
Oil surfacing)							
Major drainage structures		380 ft	400 ft				
Minor drainage structures							
Rights of way		600	200				
Engineering & administration costs							
a. Grade, gravel, oil							
b. 5% of cost of major drainage							
Subtotal							
Plus 10% for contingencies							
Total average cost per mile							
Total Costs for Constructed Miles							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	284,000	955,500	2,055,000	3,294,500			
Oil surfacing)							
Major drainage structures		55,100	58,000	113,100	600,000		
Minor drainage structures							
Rights of way		16,380	13,700	30,080			
Engineering & administration costs							
a. Grade, gravel, oil - 20%	56,800	191,100	411,000	658,900			
b. 5% of cost of major drainage		2,755	2,900	5,655	30,000		
Subtotal	340,800	1,220,835	2,540,600	4,102,235	630,000		
Plus 10% for contingencies	34,080	122,084	254,060	410,224	63,000		
Total unamortized construction cost	374,880	1,342,919	2,794,660	4,512,459	693,000		
Annual capital cost Bridge (40 year)					17,325		
(20 yrs. [illegible]	18,744	67,145	139,733	225,622			
Maintenance cost at $ 700 **per mile**	9,940	19,110	47,950	77,000	550		
Total annual costs	28,684	86,255	187,683	302,622	17,875		
			Bridge	17,875			
		Total Annual Cost		$320,497			

Section:

A- Lewistown-Hilger (Widen & Surface)

B- Hilger-Winifred (New Construction)

C-Winifred-Big Sandy (New Construction)

TABLE NO. 2-e

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Roy-Malta Route **Counties** Fergus, Phillips

Average Costs per Mile	Sec. A 14.2 mi.	Sec. B 36.4 mi.	Sec. C 43.3 mi	Sec. D 38.6 mi.	Total 132.5 mi	Missouri Bridge	
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	20,000	20,000	35,000	15,000			
Oil surfacing)							
Major drainage structures			667 ft.				
Minor drainage structures							
Rights of way							
Engineering & administration costs							
a. Grade, gravel, oil							
b. 5% of cost of major drainage							
Subtotal							
Plus 10% for contingencies							
Total average cost per mile							
Total Costs for Constructed Miles							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	284,000	728,000	1,515,500	579,000	3,106,500		
Oil surfacing)							
Major drainage structures			96,715		96,715	700,000	
Minor drainage structures							
Rights of way							
Engineering & administration costs							
a. Grade, gravel, oil -20%	56,800	145,600	303,100	115,800	621,300		
b. 5% of cost of major drainage			4,836		4,836	35,000	
Subtotal	340,800	873,600	1,920,151	694,800	3,829,351	735,000	
Plus 10% for contingencies	34,080	87,360	192,015	69,480	382,935	73,500	
Total unamortized construction cost	374,880	960,960	2,112,166	764,280	4,212,286	808,500	
Annual capital cost Bridge-40 years						20,212	
(20 yrs. [illegible]**)**	18,744	48,048	105,608	38,214	210,614		
Maintenance cost at $ 700 **per mile**	9,940	25,480	30,310	27,020	92,750	550	
Total annual costs	28,684	73,528	135,918	65,234	303,364	20,762	
				Bridge	20,762		
Section:			Total Annual Cost		$324,126		
A-Lewistown-Hilger (Widen & Surface)							
B-Hilger-N of Roy (Widen & Surface)							
C-Sec. B to Malta Constr. (New Constr.)							
D-Present Construction (Widen & Surface)							

TABLE NO. 2-f

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Lewistown-Roy-Harlem Route **Counties** Fergus, Blaine

Average Costs per Mile	Sec. A 14.2 mi.	Sec. B 36.4 mi.	Sec. C 51.8 mi.	Sec. D 3.0 mi.	Sec. E 33.1 mi.	Total 138.5 mi.	Missouri Bridge
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	20,000	20,000	35,000	50,000	30,000		
Oil surfacing)							
Major drainage structures			456 ft.	120 ft.	220 ft.		
Minor drainage structures							
Rights of way			200	200	600		
Engineering & administration costs							
a. Grade, gravel, oil							
b. 5% of cost of major drainage							
Subtotal							
Plus 10% for contingencies							
Total average cost per mile							
Total Costs for Constructed Miles							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	284,000	728,000	1,813,000	150,000	993,000	3,968,000	
Oil surfacing)							
Major drainage structures			66,120	17,400	31,900	115,420	700,000
Minor drainage structures							
Rights of way			10,360	600	19,860	30,820	
Engineering & administration costs							
a. Grade, gravel, oil -20%	56,800	145,600	362,600	30,000	198,600	793,600	
b. 5% of cost of major drainage			3,306	870	1,595	5,771	35,000
Subtotal	340,800	873,600	2,255,386	198,870	1,244,955	4,913,611	735,000
Plus 10% for contingencies	34,080	87,360	225,539	19,887	124,496	491,362	73,500
Total unamortized construction cost	374,880	960,960	2,480,925	218,757	1,369,451	5,404,973	808,500
Annual capital cost Bridge-40 years							20,212
(20 yrs. [illegible]**)**	18,744	48,048	124,046	10,938	68,472	270,248	
Maintenance cost at $700 **per mile**	9,940	25,480	36,260	2,100	23,170	96,950	550
Total annual costs	28,684	73,528	160,306	13,038	91,642	367,198	20,762
					Bridge	20,762	
Section:				Total Annual Cost		$387,960	
A- Lewistown-Hilger (Widen & Surface)							
B-Hilger-N of Roy (Widen & Surface)							
C-N of Roy-Landusky Jct. (New Constr.)							
D-Over Little Rockies (New Constr.)							
E-Hays-Jct. Rte. I (New Constr.)							

TABLE NO. 2-g

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Grass Range-Malta Route **Counties** Fergus, Phillips

Average Costs per Mile	Sec. A 21.0 mi.	Sec. B 5.6 mi.	Sec. C 43.0 mi.	Sec. D 38.6 mi.	Total 108.2 mi	Missouri Bridge		
Grading, clearing, etc.)								
Gravel base & surfacing) Combined	30,000	15,000	35,000	15,000				
Oil surfacing)								
Major drainage structures	324 ft.		667 ft.					
Minor drainage structures								
Rights of way	400		200					
Engineering & administration costs								
a. Grade, gravel, oil								
b. 5% of cost of major drainage								
Subtotal								
Plus 10% for contingencies								
Total average cost per mile								
Total Costs for Constructed Miles								
Grading, clearing, etc.)								
Gravel base & surfacing)	630,000	84,000	1,505,000	579,000	2,798,000			
Oil surfacing)								
Major drainage structures	46,980		96,715		143,695	700,000		
Minor drainage structures								
Rights of way	8,400		8,600		17,000			
Engineering & administration costs								
a. Grade, gravel, oil 20%	126,000	16,800	301,000	115,800	559,600			
b. 5% of cost of major drainage	2,349		4,838		7,187	35,000		
Subtotal	813,729	100,800	1,916,153	694,800	3,525,482	735,000		
Plus 10% for contingencies	81,373	10,080	191,615	69,480	352,548	73,500		
Total unamortized construction cost	895,102	110,880	2,107,768	764,280	3,878,030	808,500		
Annual capital cost Bridge-40 years						20,212		
(20 yrs. ~~[illegible]~~	44,755	5,544	105,388	38,214	193,901			
Maintenance cost at $ 700 **per mile**	14,700	3,920	30,100	27,020	75,740	550		
Total annual costs	59,455	9,464	135,488	65,234	269,641	20,762		
				Bridge	20,762			
Section:			Total Annual Cost		$290,403			
A-Rte. 15 to Roy Jct. (New Constr.)								
B-Present Construction (Widen & Surface)								
C-Intervening section (New Construction)								
D- Malta South Constr. (Widen & Surface)								

TABLE NO. 2-h

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - COST

Location Grass Range-Harlem Route **Counties** Fergus, Blaine

Average Costs per Mile	Sec. A 21.0 mi.	Sec. B 5.6 mi.	Sec. C 51.5 mi.	Sec. D 3.0 mi.	Sec. E 33.1 mi.	Total 114.2 mi.	Missouri Bridge
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	30,000	15,000	35,000	50,000	30,000		
Oil surfacing)							
Major drainage structures	324 ft.		456 ft.	120 ft	220 ft.		
Minor drainage structures							
Rights of way	400		200	200	600		
Engineering & administration costs							
a. Grade, gravel, oil							
b. 5% of cost of major drainage							
Subtotal							
Plus 10% for contingencies							
Total average cost per mile							
Total Costs for Constructed Miles							
Grading, clearing, etc.)							
Gravel base & surfacing) Combined	630,000	84,000	1,802,500	150,000	993,000	3,659,500	
Oil surfacing)							
Major drainage structures	46,980		66,120	17,400	31,900	162,400	700,000
Minor drainage structures							
Rights of way	8,400		10,300	600	19,860	39,160	
Engineering & administration costs							
a. Grade, gravel, oil 20%	126,000	16,800	360,500	30,000	198,600	731,900	
b. 5% of cost of major drainage	2,349		3,306	870	1,595	8,120	35,000
Subtotal	813,729	100,800	2,242,726	198,870	1,244,955	4,601,080	735,000
Plus 10% for contingencies	81,373	10,080	224,273	19,887	124,495	460,108	73,500
Total unamortized construction cost	895,102	110,880	2,466,999	218,757	1,369,450	5,061,188	808,500
Annual capital cost Bridge-40 years							20,212
(20 yrs. ~~at 2½% [illegible]~~)	44,755	5,544	123,350	10,938	68,472	253,059	
Maintenance cost at $ 700 **per mile**	14,700	3,920	36,050	2,100	23,170	79,940	550
Total annual costs	59,455	9,464	159,400	13,038	91,642	332,999	20,762
					Bridge	20,762	
Section:				Total Annual Cost		$353,761	
A- Rte. 15 to Roy Jct. (New Constr.)							
B-Present Construction (Widen & Surface)							
C-No. to Landusky Jct. (New Constr.)							
D-Over Little Rockies (New Construction)							
E- Hats-Jct. Rte. 1 (New Construction)							

TABLE NO. 3-a
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

Passenger Cars	Proposed	Present
Avg. speed (Mi. per hr.).	43	31
Distance (miles)..........	147.5	149.6
Time (hrs. per trip).....	3.43	4.82
Time savings per vehicle.	1.39	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	30,784	
Tot. value of time savings	38,480	

Light Trucks		
Avg. speed (Mi. per hr.).	39	28
Distance (miles)..........	147.5	149.6
Time (hrs. per trip).....	3.78	5.34
Time savings per vehicle.	1.56	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	16,170	
Tot. value of time savings	32,502	

Medium Trucks		
Avg. speed (Mi. per hr.).	35	24
Distance (miles)..........	147.5	149.6
Time (hrs. per trip).....	4.21	6.23
Time savings per vehicle.	2.02	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	5,497	
Tot. value of time savings	19,404	

Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	22
Distance (Miles)..........	147.5	149.6
Time (hrs. per trip).....	4.60	6.80
Time savings per vehicle.	2.20	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	583	
Tot. value of time savings	2,822	
TOTAL	$93,208	

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-b

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Malta
External Diverted Traffic
Counties Fergus, Phillips
Date of Analysis 5-16-49

Passenger Cars	Proposed	Present
Avg. speed (Mi. per hr.).	43	43
Distance (miles).........	316.0	397.8
Time (hrs. per trip).....	7.34	9.23
Time savings per vehicle.	1.89	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	16,425	
Tot. value of time savings	27,922	

Light Trucks		
Avg. speed (Mi. per hr.).	39	39
Distance (miles).........	316.0	397.8
Time (hrs. per trip).....	8.10	10.20
Time savings per vehicle.	2.10	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	8,030	
Tot. value of time savings	21,761	

Medium Trucks		
Avg. speed (Mi. per hr.).	35	35
Distance (miles).........	316.0	397.8
Time (hrs. per trip).....	9.02	11.36
Time savings per vehicle.	2.34	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	1,460	
Tot. value of time savings	5,971	

Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	32
Distance (Miles).........	316.0	397.8
Time (hrs. per trip).....	9.87	12.43
Time savings per vehicle.	2.56	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	2,555	
Tot. value of time savings	14,384	
TOTAL	$70,038	

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-c
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Harlem
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Passenger Cars	Proposed	Present
Avg. speed (Mi. per hr.).	43	31
Distance (miles)..........	145.0	147.6
Time (hrs. per trip).....	3.37	4.76
Time savings per vehicle.	1.39	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	33,499	
Tot. value of time savings	41,874	
Light Trucks		
Avg. speed (Mi. per hr.).	39	28
Distance (miles)..........	145.0	147.6
Time (hrs. per trip).....	3.72	5.27
Time savings per vehicle.	1.55	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	11,545	
Tot. value of time savings	23,090	
Medium Trucks		
Avg. speed (Mi. per hr.).	35	25
Distance (miles)..........	145.0	147.6
Time (hrs. per trip).....	4.14	5.90
Time savings per vehicle.	1.76	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	8,490	
Tot. value of time savings	26,149	
Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	22
Distance (Miles)..........	145.0	147.6
Time (hrs. per trip).....	4.53	6.70
Time savings per vehicle.	2.17	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	160	
Tot. value of time savings	763	
TOTAL	$91,876	

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-d
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Passenger Cars	Proposed	Present					
Avg. speed (Mi. per hr.).	43	43					
Distance (miles)..........	289.2	373.9					
Time (hrs. per trip).....	6.72	8.69					
Time savings per vehicle.	1.97						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	22,477						
Tot. value of time savings	$39,784						
Light Trucks							
Avg. speed (Mi. per hr.).	39	39					
Distance (miles)..........	289.2	373.9					
Time (hrs. per trip).....	7.41	9.58					
Time savings per vehicle.	2.17						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	8,030						
Tot. value of time savings	22,484						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	35					
Distance (miles)..........	289.2	373.9					
Time (hrs. per trip).....	8.26	10.68					
Time savings per vehicle.	2.42						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	1,721						
Tot. value of time savings	7,297						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	32					
Distance (Miles)..........	289.2	373.9					
Time (hrs. per trip).....	9.03	11.68					
Time savings per vehicle.	2.65						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	1,356						
Tot. value of time savings	7,958						
TOTAL	$77,523						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-e

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Chinook Route

Existing and Internal Diverted Traffic

Counties Fergus, Blaine Date of Analysis 5-16-49

	Proposed	Present
Passenger Cars		
Avg. speed (Mi. per hr.).	43	31
Distance (miles)..........	135.0	141.1
Time (hrs. per trip).....	3.13	4.55
Time savings per vehicle.	1.42	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	31,842	
Tot. value of time savings	40,758	
Light Trucks		
Avg. speed (Mi. per hr.).	39	28
Distance (miles)..........	135.0	141.1
Time (hrs. per trip).....	3.46	5.03
Time savings per vehicle.	1.57	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	13,629	
Tot. value of time savings	27,530	
Medium Trucks		
Avg. speed (Mi. per hr.).	35	25
Distance (miles)..........	135.0	141.1
Time (hrs. per trip).....	3.85	5.60
Time savings per vehicle.	1.75	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	9,194	
Tot. value of time savings	28,134	
Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	22
Distance (Miles)..........	135.0	141.1
Time (hrs. per trip).....	4.21	6.41
Time savings per vehicle.	2.20	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	362	
Tot. value of time savings	1,752	
TOTAL	$98,174	

1 % Grade Speeds used

% " " "

% " " "

TABLE NO. 3-f
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Chinook Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Passenger Cars	Proposed	Present
Avg. speed (Mi. per hr.).	43	43
Distance (miles)..........	286.7	375.5
Time (hrs. per trip).....	6.66	8.73
Time savings per vehicle.	2.07	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	35,770	
Tot. value of time savings	66,532	
Light Trucks		
Avg. speed (Mi. per hr.).	39	39
Distance (miles)..........	286.7	375.5
Time (hrs. per trip).....	7.35	9.62
Time savings per vehicle.	2.27	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	9,855	
Tot. value of time savings	28,875	
Medium Trucks		
Avg. speed (Mi. per hr.).	35	35
Distance (miles)..........	286.7	375.5
Time (hrs. per trip).....	8.19	10.72
Time savings per vehicle.	2.53	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	2,555	
Tot. value of time savings	11,318	
Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	32
Distance (Miles)..........	286.7	375.5
Time (hrs. per trip).....	8.95	11.73
Time savings per vehicle.	2.78	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	2,190	
Tot. value of time savings	13,403	
TOTAL	$120,128	

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-g
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Big Sandy Route
Existing and Internal Diverted Traffic
Counties Fergus, Chouteau Date of Analysis 5-16-49

	Proposed	Present					
Passenger Cars							
Avg. speed (Mi. per hr.).	43	31					
Distance (miles)..........	110.0	112.9					
Time (hrs. per trip).....	2.55	3.64					
Time savings per vehicle.	1.09						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	41,457						
Tot. value of time savings	40,628						
Light Trucks							
Avg. speed (Mi. per hr.).	39	28					
Distance (miles)..........	110.0	112.9					
Time (hrs. per trip).....	2.82	4.03					
Time savings per vehicle.	1.21						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	16,002						
Tot. value of time savings	24,963						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	25					
Distance (miles)..........	110.0	112.9					
Time (hrs. per trip).....	3.14	4.51					
Time savings per vehicle.	1.37						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	10,556						
Tot. value of time savings	25,334						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	22					
Distance (Miles)..........	110.0	112.9					
Time (hrs. per trip).....	3.43	5.13					
Time savings per vehicle.	1.70						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	572						
Tot. value of time savings	2,139						
TOTAL	$93,064						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-h
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Winifred-Big Sandy Route
External Diverted Traffic
Counties Fergus, Chouteau Date of Analysis 5-16-49

	Proposed	Present
Passenger Cars		
Avg. speed (Mi. per hr.).	43	43
Distance (miles).........	304.8	369.0
Time (hrs. per trip).....	7.08	8.58
Time savings per vehicle.	1.50	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	37,960	
Tot. value of time savings	51,246	
Light Trucks		
Avg. speed (Mi. per hr.).	39	39
Distance (miles).........	304.8	369.0
Time (hrs. per trip).....	7.81	9.46
Time savings per vehicle.	1.65	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	11,315	
Tot. value of time savings	24,101	
Medium Trucks		
Avg. speed (Mi. per hr.).	35	35
Distance (miles).........	304.8	369.0
Time (hrs. per trip).....	8.70	10.54
Time savings per vehicle.	1.84	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	2,555	
Tot. value of time savings	8,227	
Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	32
Distance (Miles).........	304.8	369.0
Time (hrs. per trip).....	9.52	11.53
Time savings per vehicle.	2.01	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	2,190	
Tot. value of time savings	9,680	
TOTAL	$93,254	

_____% Grade Speeds used _____
_____% " " " _____
_____% " " " _____

TABLE NO. 3-i
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Roy-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

Passenger Cars	Proposed	Present
Avg. speed (Mi. per hr.).	43	33
Distance (miles)..........	132.5	133.8
Time (hrs. per trip).....	3.08	4.05
Time savings per vehicle.	0.97	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	25,331	
Tot. value of time savings	22,038	

Light Trucks		
Avg. speed (Mi. per hr.).	39	30
Distance (miles)..........	132.5	133.8
Time (hrs. per trip).....	3.39	4.46
Time savings per vehicle.	1.07	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	13,410	
Tot. value of time savings	18,506	

Medium Trucks		
Avg. speed (Mi. per hr.).	35	27
Distance (miles)..........	132.5	133.8
Time (hrs. per trip).....	3.78	4.95
Time savings per vehicle.	1.17	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	3,946	
Tot. value of time savings	8,126	

Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	24
Distance (Miles)..........	132.5	133.8
Time (hrs. per trip).....	4.14	5.57
Time savings per vehicle.	1.43	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	474	
Tot. value of time savings	1,493	
TOTAL	$50,163	

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-j
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Roy-Malta Route
External Diverted Traffic
Counties Fergus, Phillips
Date of Analysis 5-16-49

	Proposed	Present					
Passenger Cars							
Avg. speed (Mi. per hr.).	43	43					
Distance (miles).........	298.2	374.9					
Time (hrs. per trip).....	6.93	8.71					
Time savings per vehicle.	1.78						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	28,470						
Tot. value of time savings	45,552						
Light Trucks							
Avg. speed (Mi. per hr.).	39	39					
Distance (miles).........	298.2	374.9					
Time (hrs. per trip).....	7.65	9.61					
Time savings per vehicle.	1.96						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	8,030						
Tot. value of time savings	20,316						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	35					
Distance (miles).........	298.2	374.9					
Time (hrs. per trip).....	8.52	10.71					
Time savings per vehicle.	2.19						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	2,555						
Tot. value of time savings	9,785						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	32					
Distance (Miles).........	298.2	374.9					
Time (hrs. per trip).....	9.31	11.71					
Time savings per vehicle.	2.40						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	2,190						
Tot. value of time savings	11,563						
TOTAL	$87,216						

____% Grade Speeds used ____
____% " " " ____
____% " " " ____

TABLE NO. 3-k
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown Roy-Harlem Route
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-5-16-49

	Proposed	Present
Passenger Cars		
Avg. speed (Mi. per hr.).	43	31
Distance (miles).........	138.5	149.2
Time (hrs. per trip).....	3.22	4.81
Time savings per vehicle.	1.59	
Value of savings($/veh-hr)	0.90	
Annual traffic volume....	24,667	
Tot. value of time savings	35,274	
Light Trucks		
Avg. speed (Mi. per hr.).	39	28
Distance (miles).........	138.5	149.2
Time (hrs. per trip).....	3.55	5.32
Time savings per vehicle.	1.77	
Value of savings($/veh-hr)	1.29	
Annual traffic volume....	8,665	
Tot. value of time savings	19,756	
Medium Trucks		
Avg. speed (Mi. per hr.).	35	25
Distance (miles).........	138.5	149.2
Time (hrs. per trip).....	3.95	5.97
Time savings per vehicle.	2.02	
Value of savings($/veh-hr)	1.75	
Annual traffic volume....	5,643	
Tot. value of time savings	19,976	
Heavy Trucks & Buses		
Avg. speed (Mi. per hr.).	32	22
Distance (Miles).........	138.5	149.2
Time (hrs. per trip).....	4.32	6.78
Time savings per vehicle.	2.46	
Value of savings($/veh-hr)	2.20	
Annual traffic volume....	135	
Tot. value of time savings	730	
TOTAL	$75,736	

1 % Grade Speeds used
% " " "
% " " "

TABLE 3-1
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Lewistown-Roy-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine
Date of Analysis 5-16-49

Passenger Cars	Proposed	Present					
Avg. speed (Mi. per hr.).	43	43					
Distance (miles)..........	289.1	375.5					
Time (hrs. per trip).....	6.72	8.73					
Time savings per vehicle.	2.01						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	25,724						
Tot. value of time savings	46,560						
Light Trucks							
Avg. speed (Mi. per hr.).	39	39					
Distance (miles)..........	289.1	375.5					
Time (hrs. per trip).....	7.41	9.62					
Time savings per vehicle.	2.21						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	9,855						
Tot. value of time savings	28,087						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	35					
Distance (miles)..........	289.1	375.5					
Time (hrs. per trip).....	8.26	10.72					
Time savings per vehicle.	2.46						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	1,716						
Tot. value of time savings	7,379						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	32					
Distance (Miles)..........	289.1	375.5					
Time (hrs. per trip).....	9.03	11.73					
Time savings per vehicle.	2.70						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	1,350						
Tot. value of time savings	8,019						
TOTAL	$90,045						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-m
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Grass Range-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

	Proposed	Present					
Passenger Cars							
Avg. speed (Mi. per hr.).	43	31					
Distance (miles).........	108.2	109.5					
Time (hrs. per trip).....	2.51	3.53					
Time savings per vehicle.	1.02						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	10,161						
Tot. value of time savings	9,348						
Light Trucks							
Avg. speed (Mi. per hr.).	39	27					
Distance (miles).........	108.2	109.5					
Time (hrs. per trip).....	2.77	4.05					
Time savings per vehicle.	1.28						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	6,019						
Tot. value of time savings	9,931						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	24					
Distance (miles).........	108.2	109.5					
Time (hrs. per trip).....	3.09	4.56					
Time savings per vehicle.	1.47						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	2,055						
Tot. value of time savings	5,281						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	21					
Distance (Miles).........	108.2	109.5					
Time (hrs. per trip).....	3.38	5.21					
Time savings per vehicle.	1.83						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	252						
Tot. value of time savings	1,015						
TOTAL	$25,575						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-n

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Grass Range-Malta Route
External Diverted Traffic
Counties Fergus, Phillips
Date of Analysis 5-16-49

	Proposed	Present					
Passenger Cars							
Avg. speed (Mi. per hr.).	43	43					
Distance (miles).........	263.4	376.4					
Time (hrs. per trip).....	6.12	8.75					
Time savings per vehicle.	2.63						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	28,470						
Tot. value of time savings	67,473						
Light Trucks							
Avg. speed (Mi. per hr.).	39	39					
Distance (miles).........	263.4	376.4					
Time (hrs. per trip).....	6.75	9.65					
Time savings per vehicle.	2.90						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	9,855						
Tot. value of time savings	36,857						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	35					
Distance (miles).........	263.4	376.4					
Time (hrs. per trip).....	7.52	10.75					
Time savings per vehicle.	3.23						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	2,555						
Tot. value of time savings	14,436						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	32					
Distance (Miles).........	263.4	376.4					
Time (hrs. per trip).....	8.23	11.76					
Time savings per vehicle.	3.53						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	2,190						
Tot. value of time savings	17,016						
TOTAL	$135,782						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-o

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Grass Range-Harlem Route
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

	Proposed	Present					
Passenger Cars							
Avg. speed (Mi. per hr.).	43	30					
Distance (miles).........	114.2	124.9					
Time (hrs. per trip).....	2.65	4.16					
Time savings per vehicle.	1.51						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	9,757						
Tot. value of time savings	13,269						
Light Trucks							
Avg. speed (Mi. per hr.).	39	27					
Distance (miles).........	114.2	124.9					
Time (hrs. per trip).....	2.92	4.62					
Time savings per vehicle.	1.70						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	3,493						
Tot. value of time savings	7,649						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	24					
Distance (miles).........	114.2	124.9					
Time (hrs. per trip).....	3.26	5.20					
Time savings per vehicle.	1.94						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	2,759						
Tot. value of time savings	9,353						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	21					
Distance (Miles).........	114.2	124.9					
Time (hrs. per trip).....	3.56	5.94					
Time savings per vehicle.	2.38						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	66						
Tot. value of time savings	346						
TOTAL	$30,617						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 3-p
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TIME ELEMENT SAVINGS

Location Grass Range-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine
Date of Analysis 5-16-49

Passenger Cars	Proposed	Present					
Avg. speed (Mi. per hr.).	43	43					
Distance (miles).........	239.9	375.5					
Time (hrs. per trip).....	5.57	8.73					
Time savings per vehicle.	3.16						
Value of savings($/veh-hr)	0.90						
Annual traffic volume....	25,537						
Tot. value of time savings	72,525						
Light Trucks							
Avg. speed (Mi. per hr.).	39	39					
Distance (miles).........	239.9	375.5					
Time (hrs. per trip).....	6.15	9.62					
Time savings per vehicle.	3.47						
Value of savings($/veh-hr)	1.29						
Annual traffic volume....	9,855						
Tot. value of time savings	44,150						
Medium Trucks							
Avg. speed (Mi. per hr.).	35	35					
Distance (miles).........	239.9	375.5					
Time (hrs. per trip).....	6.85	10.73					
Time savings per vehicle.	3.88						
Value of savings($/veh-hr)	1.75						
Annual traffic volume....	1,688						
Tot. value of time savings	11,461						
Heavy Trucks & Buses							
Avg. speed (Mi. per hr.).	32	32					
Distance (Miles).........	239.9	375.5					
Time (hrs. per trip).....	7.49	11.73					
Time savings per vehicle.	4.24						
Value of savings($/veh-hr)	2.20						
Annual traffic volume....	1,323						
Tot. value of time savings	12,343						
TOTAL	$140,479						

1 % Grade Speeds used
% " " "
% " " "

TABLE NO. 4-a

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	58.05	x 2.07	= .0120164	
% Commercial	41.95	x 1.52	= .0063764	
Total			.0183928	= Cost ($ / ton-mile)
	Increased 50%		.02758875	

	Proposed	Present		
Distance				
Length (miles)..................	147.500	149.591		
Distance saving (miles).........	2.091			
Average annual traffic (tons)...	151,586			
Annual traffic saving (ton-mi.).	316,966			
Cost ($/ton-mile)...............	.02758875			
Total annual saving.............	8,744			
Surface				
Roadway surface type............	.03	.17		
Saving coefficient..............	.14			
Aver. annual traffic (ton-mi.)..	22,358,935			
Saving ($/ton-mile).............	.00386243			
Total annual saving.............	86,359			
Alignment				
Curvature rating................	8	5		
Points improvement..............	3			
Saving (point-ton-miles)........	67,086,805			
Saving ($/point-ton-mile).......	.00015			
Total annual saving.............	10,061			
Rise and Fall				
Rise and fall (feet)............				
Saving (feet)...................	9,376			
Saving (foot-tons)..............	1,421,270,336			
Saving ($/foot-ton).............	.000004686			
Total annual saving.............	6,660			
Gradient				
Gradients in per cent...........				
Red'n. in gradient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Traffic Stops				
Number per year.................				
Eliminated per year.............	-0-			
Aver. vehicular weight (tons)...				
Saving ($ per ton-per stop).....				
Total annual saving.............				
TOTAL	$111,824			

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Malta Route
External Diverted Traffic
Counties Fergus, Phillips
Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	58.46	x	2.07	=	.01210122	
% Commercial	41.54	x	1.35	=	.00560790	
Total					.01770912	= Cost ($ / ton-mile)
	Increased 50%				.0265637	

Distance

	Proposed	Present		
Length (miles)	315.98	397.75		
Distance saving (miles)	81.77			
Average annual traffic (tons)	105,026			
Annual traffic saving (ton-mi.)	8,587,976			
Cost ($/ton-mile)	.0265637			
Total annual saving	228,128			

Surface

Roadway surface type	.03	.03		
Saving coefficient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				

Alignment

Curvature rating				
Points improvement	-0-			
Saving (point-ton-miles)				
Saving ($/point-ton-mile)				
Total annual saving				

Rise and Fall

Rise and fall (feet)				
Saving (feet)	1,649			
Saving (foot-tons)	173,187,874			
Saving ($/foot-ton)	.000005125			
Total annual saving	887			

Gradient

Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				

Traffic Stops

Number per year				
Eliminated per year	255,834			
Aver. vehicular weight (tons)	3.69			
Saving ($ per ton-per stop)	.00189			
Total annual saving	1,784			
TOTAL	$230,799			

TABLE NO. 4-c
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Harlem Route
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	62.39	x 2.07	=	.0129147	
% Commercial	37.61	x 1.55	=	.0058295	
Total				.0187442	= Cost ($ / ton-mile)
	Increased 50%			.0281163	

	Proposed	Present		
Distance				
Length (miles)	145.0	147.6		
Distance saving (miles)	2.6			
Average annual traffic (tons)	154,392			
Annual traffic saving (ton-mi.)	401,419			
Cost ($/ton-mile)	.0281163			
Total annual saving	11,286			
Surface				
Roadway surface type	.03	.21		
Saving coefficient	.18			
Aver. annual traffic (ton-mi.)	22,386,840			
Saving ($/ton-mile)	.0050609			
Total annual saving	113,297			
Alignment				
Curvature rating	8	5		
Points improvement	3			
Saving (point-ton-miles)	67,160,520			
Saving ($/point-ton-mile)	.00015			
Total annual saving	10,074			
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	9,280			
Saving (foot-tons)	1,432,757,760			
Saving ($/foot-ton)	.000005455			
Total annual saving	7,815			
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	-0-			
Aver. vehicular weight (tons)				
Saving ($ per ton-per stop)				
Total annual saving				
TOTAL	$142,472			

TABLE NO. 4-d
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	68.42	x	2.07	=	.014163	
% Commercial	31.58	x	1.36	=	.004295	
Total					.018458	= Cost ($ / ton-mile)
	Increased 50%				.027687	

	Proposed	Present		
Distance				
Length (miles)...................	289.22	373.91		
Distance saving (miles)..........	84.69			
Average annual traffic (tons)...	92,469			
Annual traffic saving (ton-mi.).	7,831,200			
Cost ($/ton-mile)................	.027687			
Total annual saving............	216,822			
Surface				
Roadway surface type............				
Saving coefficient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving............				
Alignment				
Curvature rating................				
Points improvement..............	-0-			
Saving (point-ton-miles)........				
Saving ($/point-ton-mile).......				
Total annual saving............				
Rise and Fall				
Rise and fall (feet)............				
Saving (feet)...................	-0-			
Saving (foot-tons)..............				
Saving ($/foot-ton).............				
Total annual saving............				
Gradient				
Gradients in per cent...........				
Red'n. in gradient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving............				
Traffic Stops				
Number per year.................				
Eliminated per year.............	367,348			
Aver. vehicular weight (tons)...	2.87			
Saving ($ per ton-per stop).....	.00189			
Total annual saving............	1,993			
TOTAL	$218,815			

TABLE NO. 4-e

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Chinook Route
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	57.87	x 2.07	=	.011979	
% Commercial	42.13	x 1.50	=	.006319	
Total				.018298	= Cost ($ / ton-mile)
		Increased 50%		.027447	

	Proposed	Present		
Distance				
Length (miles)	135.0	141.1		
Distance saving (miles)	6.1			
Average annual traffic (tons)	166,719			
Annual traffic saving (ton-mi.)	1,016,986			
Cost ($/ton-mile)	.027447			
Total annual saving	27,913			
Surface				
Roadway surface type	.03	.21		
Saving coefficient	.18			
Aver. annual traffic (ton-mi.)	22,507,065			
Saving ($/ton-mile)	.0049405			
Total annual saving	111,196			
Alignment				
Curvature rating	8	3		
Points improvement	5			
Saving (point-ton-miles)	112,535,325			
Saving ($/point-ton-mile)	.00015			
Total annual saving	16,880			
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	8,640			
Saving (foot-tons)	1,440,452,160			
Saving ($/foot-ton)	.000005252			
Total annual saving	7,565			
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	-0-			
Aver. vehicular weight (tons)				
Saving ($ per ton-per stop)				
Total annual saving				
TOTAL	$163,554			

TABLE NO. 4-f
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Chinook Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	70.94	x	2.07	=	.014684
% Commercial	29.06	x	1.37	=	.003981
Total					.018665 = Cost ($ / ton-mile)
	Increased 50%				.027997

	Proposed	Present		
Distance				
Length (miles)...................	286.71	375.52		
Distance saving (miles)..........	88.81			
Average annual traffic (tons)...	142,367			
Annual traffic saving (ton-mi.).	12,643,613			
Cost ($/ton-mile)................	.027997			
Total annual saving.............	353,983			
Surface				
Roadway surface type............				
Saving coefficient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Alignment				
Curvature rating................				
Points improvement..............	-0-			
Saving (point-ton-miles)........				
Saving ($/point-ton-mile).......				
Total annual saving.............				
Rise and Fall				
Rise and fall (feet)............				
Saving (feet)...................	-0-			
Saving (foot-tons)..............				
Saving ($/foot-ton).............				
Total annual saving.............				
Gradient				
Gradients in per cent...........				
Red'n. in gradient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Traffic Stops				
Number per year.................				
Eliminated per year.............	452,626			
Aver. vehicular weight (tons)...	2.83			
Saving ($ per ton-per stop).....	.00189			
Total annual saving.............	2,421			
TOTAL	$356,404			

TABLE NO. 4-g

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Big Sandy Route
Existing and Internal Diverted Traffic
Counties Fergus, Chouteau Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	60.48	x	2.07	=	.0125194	
% Commercial	39.52	x	1.47	=	.0058094	
Total					.0183288	= Cost ($ / ton-mile)
	Increased 50%				.0274932	

	Proposed	Present		
Distance				
Length (miles)...................	110.0	112.9		
Distance saving (miles).........	2.9			
Average annual traffic (tons)...	202,434			
Annual traffic saving (ton-mi.).	587,059			
Cost ($/ton-mile)...............	.0274932			
Total annual saving.............	16,140			
Surface				
Roadway surface type............	.03	.19		
Saving coefficient..............	.16			
Aver. annual traffic (ton-mi.)..	22,267,740			
Saving ($/ton-mile).............	.0043989			
Total annual saving.............	97,953			
Alignment				
Curvature rating................	8	5		
Points improvement..............	3			
Saving (point-ton-miles)........	66,803,220			
Saving ($/point-ton-mile).......	.00015			
Total annual saving.............	10,020			
Rise and Fall				
Rise and fall (feet)............				
Saving (feet)...................	7,040			
Saving (foot-tons)..............	1,425,135,360			
Saving ($/foot-ton).............	.000005508			
Total annual saving.............	7,849			
Gradient				
Gradients in per cent...........				
Red'n. in gradient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Traffic Stops				
Number per year.................				
Eliminated per year.............	-0-			
Aver. vehicular weight (tons)...				
Saving ($ per ton-per stop).....				
Total annual saving.............				
TOTAL	$131,962			

TABLE NO. 4-h
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Winifred-Big Sandy Route
External Diverted Traffic
Counties Fergus, Chouteau Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	70.40	x 2.07	=	.0145728	
% Commercial	29.60	x 1.38	=	.0040848	
Total				.0186576	= Cost ($ / ton-mile)
	Increased 50%			.0279864	

Distance	Proposed	Present		
Length (miles)....................	304.78	369.04		
Distance saving (miles)..........	64.26			
Average annual traffic (tons)...	150,580			
Annual traffic saving (ton-mi.).	9,676,271			
Cost ($/ton-mile)................	.0279864			
Total annual saving..............	270,804			
Surface				
Roadway surface type.............				
Saving coefficient...............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile)..............				
Total annual saving..............				
Alignment				
Curvature rating.................				
Points improvement...............	-0-			
Saving (point-ton-miles).........				
Saving ($/point-ton-mile).......				
Total annual saving..............				
Rise and Fall				
Rise and fall (feet).............				
Saving (feet)....................	-0-			
Saving (foot-tons)...............				
Saving ($/foot-ton)..............				
Total annual saving..............				
Gradient				
Gradients in per cent............				
Red'n. in gradient...............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile)..............				
Total annual saving..............				
Traffic Stops				
Number per year..................				
Eliminated per year..............	290,271			
Aver. vehicular weight (tons)...	2.15			
Saving ($ per ton-per stop).....	.00189			
Total annual saving..............	1,179			

TOTAL $271,983

TABLE NO. 4-i

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Roy-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	58.66	x	2.07	=	.0121426	
% Commercial	41.34	x	1.54	=	.0063664	
Total					.0185090	= Cost ($ / ton-mile)
	Increased 50%				.0277635	

	Proposed	Present		
Distance				
Length (miles)	132.5	133.8		
Distance saving (miles)	1.3			
Average annual traffic (tons)	120,796			
Annual traffic saving (ton-mi.)	157,035			
Cost ($/ton-mile)	.027763			
Total annual saving	4,360			
Surface				
Roadway surface type	.03	.15		
Saving coefficient	.12			
Aver. annual traffic (ton-mi.)	16,005,470			
Saving ($/ton-mile)	.003332			
Total annual saving	53,330			
Alignment				
Curvature rating	8	6		
Points improvement	2			
Saving (point-ton-miles)	32,010,940			
Saving ($/point-ton-mile)	.00015			
Total annual saving	4,802			
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	8,480			
Saving (foot-tons)	1,024,350,080			
Saving ($/foot-ton)	.000005257			
Total annual saving	5,385			
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	-0-			
Aver. vehicular weight (tons)				
Saving ($ per ton-per stop)				
Total annual saving				
TOTAL	$67,877			

TABLE NO. 4-j

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Roy-Malta Route
External Diverted Traffic
Counties Fergus, Phillips Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	68.75	x 2.07 =	.0142312	
% Commercial	31.25	x 1.35 =	.0042187	
Total			.0184499	= Cost ($ / ton-mile)
		Increased 50%	.0276749	

	Proposed	Present		
Distance				
Length (miles)	298.18	374.88		
Distance saving (miles)	76.70			
Average annual traffic (tons)	125,030			
Annual traffic saving (ton-mi.)	9,589,801			
Cost ($/ton-mile)	.0276749			
Total annual saving	265,397			
Surface				
Roadway surface type				
Saving coefficient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Alignment				
Curvature rating				
Points improvement	-0-			
Saving (point-ton-miles)				
Saving ($/point-ton-mile)				
Total annual saving				
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	1,393			
Saving (foot-tons)	174,166,790			
Saving ($/foot-ton)	.000005711			
Total annual saving	995			
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	370,628			
Aver. vehicular weight (tons)	3.03			
Saving ($ per ton-per stop)	.00189			
Total annual saving	2,122			
TOTAL	$268,514			

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Roy-Harlem
Existing and Internal Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	63.07	x 2.07	=	.013055	
% Commercial	36.93	x 1.5	=	.005613	
Total				.018668	= Cost ($ / ton-mile)
	Increased 50%			.028002	

Distance	Proposed	Present		
Length (miles)	138.5	149.2		
Distance saving (miles)	10.7			
Average annual traffic (tons)	110,027			
Annual traffic saving (ton-mi.)	1,177,289			
Cost ($/ton-mile)	.028002			
Total annual saving	32,966			

Surface				
Roadway surface type	.03	.21		
Saving coefficient	.18			
Aver. annual traffic (ton-mi.)	15,238,739			
Saving ($/ton-mile)	.005040			
Total annual saving	76,803			

Alignment				
Curvature rating	8	5		
Points improvement	3			
Saving (point-ton-miles)	45,716,217			
Saving ($/point-ton-mile)	.00015			
Total annual saving	6,857			

Rise and Fall				
Rise and fall (feet)				
Saving (feet)	8,864			
Saving (foot-tons)	975,279,328			
Saving ($/foot-ton)	.000005514			
Total annual saving	5,376			

Gradient				
Gradients in per cent	-0-			
Red'n. in gradient				
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				

Traffic Stops				
Number per year				
Eliminated per year	-0-			
Aver. vehicular weight (tons)				
Saving ($ per ton-per stop)				
Total annual saving				

TOTAL $122,002

TABLE NO. 4-1
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Lewistown-Roy-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	68.22	x 2.07 =	.014121	
% Commercial	31.78	x 1.37 =	.004353	
Total			.018474	= Cost ($ / ton-mile)
	Increased 50%		.027711	

	Proposed	Present		
Distance				
Length (miles)...................	289.08	375.52		
Distance saving (miles)..........	86.44			
Average annual traffic (tons)....	103,368			
Annual traffic saving (ton-mi.)..	8,935,130			
Cost ($/ton-mile)................	.027711			
Total annual saving..............	247,601			
Surface				
Roadway surface type.............				
Saving coefficient...............	-0-			
Aver. annual traffic (ton-mi.)...				
Saving ($/ton-mile)..............				
Total annual saving..............				
Alignment				
Curvature rating.................				
Points improvement...............	-0-			
Saving (point-ton-miles).........				
Saving ($/point-ton-mile)........				
Total annual saving..............				
Rise and Fall				
Rise and fall (feet).............				
Saving (feet)....................	-0-			
Saving (foot-tons)...............				
Saving ($/foot-ton)..............				
Total annual saving..............				
Gradient				
Gradients in per cent............				
Red'n. in gradient...............	-0-			
Aver. annual traffic (ton-mi.)...				
Saving ($/ton-mile)..............				
Total annual saving..............				
Traffic Stops				
Number per year..................				
Eliminated per year..............	413,267			
Aver. vehicular weight (tons)....	2.94			
Saving ($ per ton-per stop)......	.00189			
Total annual saving..............	$2,296			
TOTAL	$249,897			

TABLE NO. 4-m
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Grass Range-Malta Route
Existing and Internal Diverted Traffic
Counties Fergus, Phillips
Date of Analysis 5-26-49

Ton-Mi. Cost Calculation

% Passenger cars	54.96	x	2.07	=	.011376
% Commercial	45.04	x	1.54	=	.006936
Total					.018312 = Cost ($ / ton-mile)
	Increased 50%				.027468

	Proposed	Present		
Distance				
Length (miles)	108.2	109.5		
Distance saving (miles)	1.3			
Average annual traffic (tons)	55,148			
Annual traffic saving (ton-mi.)	71,692			
Cost ($/ton-mile)	.027468			
Total annual saving	1,969			
Surface				
Roadway surface type	.03	.18		
Saving coefficient	.15			
Aver. annual traffic (ton-mi.)	5,967,013			
Saving ($/ton-mile)	.0041202			
Total annual saving	24,585			
Alignment				
Curvature rating	8	6		
Points improvement	2			
Saving (point-ton-miles)	11,934,026			
Saving ($/point-ton-mile)	.00015			
Total annual saving	1,790			
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	6,924			
Saving (foot-tons)	381,844,752			
Saving ($/foot-ton)	.000005499			
Total annual saving	$2,100			
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	-0-			
Aver. vehicular weight (tons)				
Saving ($ per ton-per stop)				
Total annual saving				

TOTAL $30,444

TABEL NO. 4-n

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Grass Range -Malta Route
External Diverted Traffic

Counties Fergus, Phillips Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	66.00	x	2.07	=	.013662	
% Commercial	34.00	x	1.37	=	.004658	
Total					.018320	= Cost ($ / ton-mile)
	Increased 50%				.027480	

Distance	Proposed	Present		
Length (miles)...................	263.42	376.42		
Distance saving (miles)..........	113.00			
Average annual traffic (tons)...	131,052			
Annual traffic saving (ton-mi.).	14,808,876			
Cost ($/ton-mile)................	.027480			
Total annual saving..............	406,948			
Surface				
Roadway surface type............	-0-			
Saving coefficient...............				
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Alignment				
Curvature rating................				
Points improvement...............	-0-			
Saving (point-ton-miles).........				
Saving ($/point-ton-mile).......				
Total annual saving.............				
Rise and Fall				
Rise and fall (feet).............				
Saving (feet)....................	1,629			
Saving (foot-tons)..............	213,483,708			
Saving ($/foot-ton).............	.000005468			
Total annual saving.............	1,167			
Gradient				
Gradients in per cent...........				
Red'n. in gradient..............	-0-			
Aver. annual traffic (ton-mi.)..				
Saving ($/ton-mile).............				
Total annual saving.............				
Traffic Stops				
Number per year..................				
Eliminated per year.............	387,028			
Aver. vehicular weight (tons)...	3.04			
Saving ($ per ton-per stop).....	.00189			
Total annual saving.............	2,224			
TOTAL	$410,339			

TABLE NO. 4-o

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Grass Range-Harlem Route
Existing and Internal Diverted Traffic
Counties Fergus, Blaine
Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	60.70	x	2.07	=	.012565	
% Commercial	39.30	x	1.49	=	.005858	
Total					.018423	= Cost ($ / ton-mile)
	Increased 50%				.027634	

	Proposed	Present		
Distance				
Length (miles)...................	114.2	124.9		
Distance saving (miles)..........	10.7			
Average annual traffic (tons)....	47,853			
Annual traffic saving (ton-mi.)..	512,027			
Cost ($/ton-mile)................	.027634			
Total annual saving..............	14,149			
Surface				
Roadway surface type.............	.03	.24		
Saving coefficient...............	.21			
Aver. annual traffic (ton-mi.)...	5,464,813			
Saving ($/ton-mile)..............	.005803			
Total annual saving..............	31,712			
Alignment				
Curvature rating.................	8	4		
Points improvement...............	4			
Saving (point-ton-miles).........	21,859,252			
Saving ($/point-ton-mile)........	.00015			
Total annual saving..............	3,279			
Rise and Fall				
Rise and fall (feet).............				
Saving (feet)....................	7,309			
Saving (foot-tons)...............	349,757,577			
Saving ($/foot-ton)..............	.000005449			
Total annual saving..............	1,906			
Gradient				
Gradients in per cent............				
Red'n. in gradient...............	-0-			
Aver. annual traffic (ton-mi.)...				
Saving ($/ton-mile)..............				
Total annual saving..............				
Traffic Stops				
Number per year..................				
Eliminated per year..............	-0-			
Aver. vehicular weight (tons)....				
Saving ($ per ton-per stop)......				
Total annual saving..............				
TOTAL	$51,046			

TABLE NO. 4-p

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - MILEAGE ELEMENT SAVINGS

Location Grass Range-Harlem Route
External Diverted Traffic
Counties Fergus, Blaine Date of Analysis 5-16-49

Ton-Mi. Cost Calculation

% Passenger cars	68.22	x	2.07	=	.0141215	
% Commercial	31.78	x	1.38	=	.0043856	
Total					.0185071	= Cost ($ / ton-mile)
	Increased 50%				.0277606	

	Proposed	Present		
Distance				
Length (miles)	239.87	375.52		
Distance saving (miles)	135.65			
Average annual traffic (tons)	102,307			
Annual traffic saving (ton-mi.)	13,877,944			
Cost ($/ton-mile)	.0277606			
Total annual saving	385,260			
Surface				
Roadway surface type				
Saving coefficient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Alignment				
Curvature rating				
Points improvement	-0-			
Saving (point-ton-miles)				
Saving ($/point-ton-mile)				
Total annual saving				
Rise and Fall				
Rise and fall (feet)				
Saving (feet)	-0-			
Saving (foot-tons)				
Saving ($/foot-ton)				
Total annual saving				
Gradient				
Gradients in per cent				
Red'n. in gradient	-0-			
Aver. annual traffic (ton-mi.)				
Saving ($/ton-mile)				
Total annual saving				
Traffic Stops				
Number per year				
Eliminated per year	413,267			
Aver. vehicular weight (tons)	2.94			
Saving ($ per ton-per stop)	.00189			
Total annual saving	$2,296			
TOTAL	$387,556			

TABLE NO. 5-a
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Winifred-Malta Route

Counties Fergus, Phillips Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 236,872	$ 90,011	$ 146,861
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	86,359	37,998	48,361
Earth to Gravel	48	52			
Alinement Savings	50	50	10,061	5,031	5,030
Rise & Fall Savings	100	0	7,547	7,547	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	1,784	892	892
Totals			342,623	141,479	201,144
Allocation of Time Element savings					
Time Element Savings	0	100	163,246		163,246
Allocation of Other Benefit Items					

Total Non-Fuel Function Benefits.. $ 364,390

Total Fuel Function Benefits.................................... $ 141,479

Total Annual Benefits.......................... $ 505,869

TABLE NO. 5-b
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Winifred-Harlem Route

Counties Fergus, Blaine Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 228,108	$ 86,681	$ 141,427
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	113,297	49,850	63,447
Earth to Gravel	48	52			
Alinement Savings	50	50	10,074	5,037	5,037
Rise & Fall Savings	100	0	7,815	7,815	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	1,993	997	996
Totals			361,287	150,380	210,907
Allocation of Time Element savings					
Time Element Savings	0	100	169,399		169,399
Allocation of Other Benefit Items					

Total Non-Fuel Function Benefits.. $ 380,306

Total Fuel Function Benefits................................. $ 150,380

Total Annual Benefits........................... $ 530,686

TABLE NO. 5-c

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Winifred-Chinook Route

Counties Fergus, Blaine Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 381,896	$ 145,120	$ 236,776
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	111,196	48,926	62,270
Earth to Gravel	48	52			
Alinement Savings	50	50	16,880	8,440	8,440
Rise & Fall Savings	100	0	7,565	7,565	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	2,421	1,211	1,210
Totals			519,958	211,262	308,696
Allocation of Time Element savings					
Time Element Savings	0	100	218,302		218,302
Allocation of Other Benefit Items	—	—			

Total Non-Fuel Function Benefits.................................. $ 526,998

Total Fuel Function Benefits.................................. $ 211,262

Total Annual Benefits.......................... $ 738,260

TABLE NO. 5-d
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Winifred-Big Sandy Route

Counties Fergus, Chouteau Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 286,944	$ 109,039	$ 177,905
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	97,953	43,099	54,854
Earth to Gravel	48	52			
Alinement Savings	50	50	10,020	5,010	5,010
Rise & Fall Savings	100	0	7,849	7,849	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	1,179	590	589
Totals			403,945	165,587	238,358
Allocation of Time Element savings					
Time Element Savings	0	100	186,318		186,318
Allocation of Other Benefit Items					

Total Non-Fuel Function Benefits.................................... $ 424,676

Total Fuel Function Benefits................................ $ 165,587

Total Annual Benefits.......................... $ 590,263

TABLE NO. 5-e
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Rpy-Malta Route

Counties Fergus, Phillips Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 269,757	$ 102,507	$ 167,250
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	53,330	23,465	29,865
Earth to Gravel	48	52			
Alinement Savings	50	50	4,802	2,401	2,401
Rise & Fall Savings	100	0	6,380	6,380	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	2,122	1,061	1,061
Totals			336,391	135,814	200,577
Allocation of Time Element savings					
Time Element Savings	0	100	137,379		137,379
Allocation of Other Benefit Items	—	—			

Total Non-Fuel Function Benefits.. $ 337,956

Total Fuel Function Benefits.................................. $ 135,814

Total Annual Benefits........................... $ 473,770

TABLE NO. 5-f
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Lewistown-Roy-Harlem Route

Counties Fergus, Blaine Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 280,567	$ 106,615	$ 173,952
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	76,803	33,793	43,010
Earth to Gravel	48	52			
Alinement Savings	50	50	6,857	3,428	3,429
Rise & Fall Savings	100	0	5,376	5,376	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	2,296	1,148	1,148
Totals			371,899	150,360	221,539
Allocation of Time Element savings					
Time Element Savings	0	100	165,781		165,781
Allocation of Other Benefit Items					

Total Non-Fuel Function Benefits.. $ 387,320
Total Fuel Function Benefits.................................. $ 150,360

Total Annual Benefits.......................... $ 537,680

TABLE NO. 5-g
Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Grass Range-Malta Route

Counties Fergus, Phillips

Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 408,917	$ 155,388	$ 253,529
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	24,585	10,817	13,768
Earth to Gravel	48	52			
Alinement Savings	50	50	1,790	895	895
Rise & Fall Savings	100	0	3,267	3,267	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	2,224	1,112	1,112
Totals			440,783	171,479	269,304
Allocation of Time Element savings					
Time Element Savings	0	100	161,357		161,357
Allocation of Other Benefit Items	—	—			

Total Non-Fuel Function Benefits.. $ 430,661

Total Fuel Function Benefits.................................. $ 171,479

Total Annual Benefits........................... $ 602,140

TABLE NO. 5-h

Montana Highway Planning Survey

HIGHWAY ECONOMIC ANALYSIS - TRAFFIC BENEFITS

Location Grass Range-Harlem Route

Counties Fergus, Blaine Date of Analysis 5-16-49

	% to Fuel Functions	% to Non-Fuel Functions	Total	Fuel Function	Non-Fuel Function
Allocation of Mileage Element savings					
Distance Savings	38	62	$ 399,409	$ 151,775	$ 247,634
Roadway Surface Savings					
Oil to Pavement	80	20			
Gravel to Pavement	48	52			
Earth to Pavement	48	52			
Gravel to Oil	41	59			
Earth to Oil	44	56	31,712	13,953	17,759
Earth to Gravel	48	52			
Alinement Savings	50	50	3,279	1,639	1,640
Rise & Fall Savings	100	0	1,906	1,906	
Gradient Savings	100	0			
Elim. Traffic Stops	50	50	2,296	1,148	1,148
Totals			438,602	170,421	268,181
Allocation of Time Element savings					
Time Element Savings	0	100	171,096		171,096
Allocation of Other Benefit Items	—	—			

Total Non-Fuel Function Benefits.. $ 439,277

Total Fuel Function Benefits.................................... $ 170,421

Total Annual Benefits.............................. $ 606,698

TABLE NO. 6-a
HIGHWAY PROJECT ANALYSIS

Location of Project Grass Range-Malta Route County Fergus, Phillips

Description of Project

Highway number Highway System Primary

Length 108.2 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = \$ 18,265 K_1 = 1.0000

C_a = \$ 290,403 K_2 = .9151

B_n = \$ 430,661 K_3 = .2000

B_f = \$ 171,479 K_2K_3 = .1830

K_1C_a = \$ 290,403 $1-K_2K_3$ = .8170

$Q_s=I_{ar}/K_1C_a$ = .0629

$Q_{Bn}=B_n/K_1C_a$ = 1.4830

$Q_{Bf}=B_f/K_1C_a$ = .5905

$Q'_s=Q_s-K_2K_3Q_{Bf}$ = .0451 (Minus)

$Q_c=0.707\ (Q_s+Q_{Bn}+Q_{Bf}(1-K_2K_3))$ = 1.4340

TABLE NO. 6-b
HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Winifred-Big Sandy Route County Fergus, Chouteau

Description of Project

Highway number Highway System Primary

Length 110.0 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = $ 66,822

C_a = $ 320,497

B_n = $ 424,676

B_f = $ 165,587

K_1C_a = $ 320,497

$Q_s = I_{ar}/K_1C_a =$ .2085

$Q_{Bn} = B_n/K_1C_a =$ 1.3250

$Q_{Bf} = B_f/K_1C_a =$ .5166

$Q'_s = Q_s - K_2K_3Q_{Bf} =$ .1440

$Q_c = 0.707\ (Q_s + Q_{Bn} + Q_{Bf}(1-K_2K_3)) =$ 1.4037

K_1 = 1.0000

K_2 = .6248

K_3 = .2000

K_2K_3 = .1250

$1-K_2K_3$ = .8750

TABLE NO. 6-c
HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Winifred-Chinook Route County Fergus, Blaine

Description of Project

Highway number Highway System Primary

Length 135.0 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = \$ 68,113 K_1 = 1.0000

C_a = \$ 431,873 K_2 = .6424

B_n = \$ 526,998 K_3 = .2000

B_f = \$ 211,262 K_2K_3 = .1285

K_1C_a = \$ 431,873 $1-K_2K_3$ = .8715

$Q_s = I_{ar}/K_1C_a =$ .1577

$Q_{Bn} = B_n/K_1C_a =$ 1.2203

$Q_{Bf} = B_f/K_1C_a =$ .4892

$Q'_s = Q_s - K_2K_3Q_{Bf} =$ .0948

$Q_c = 0.707\ (Q_s + Q_{Bn} + Q_{Bf}(1-K_2K_3)) =$ 1.2756

TABLE NO. 6-d
HIGHWAY PROJECT ANALYSIS

Location of Project Grass Range-Harlem Route County Fergus, Blaine

Description of Project

Highway number Highway System Primary

Length 114.2 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = \$ 16,386

K_1 = 1.0000

C_a = \$ 353,761

K_2 = .8657

B_n = \$ 439,277

K_3 = .2000

B_f = \$ 170,421

K_2K_3 = .1731

K_1C_a = \$ 353,761

$1-K_2K_3$ = .8269

$Q_s=I_{ar}/K_1C_a=$ .0463

$Q_{Bn}=B_n/K_1C_a=$ 1.2417

$Q_{Bf}=B_f/K_1C_a=$ .4817

$Q'_s=Q_s-K_2K_3Q_{Bf}$ = .0371 Minus

$Q_c=0.707\ (Q_s+Q_{Bn}+Q_{Bf}(1-K_2K_3))=$ 1.1922

TABLE NO. 6-e

HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Roy-Malta Route County Fergus, Phillips

Description of Project

Highway number Highway System Primary

Length 132.5 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = $	49,206	K_1 =	1.0000
C_a = $	324,126	K_2 =	.7577
B_n = $	337,956	K_3 =	.2000
B_f = $	135,814	K_2K_3 =	.1515
K_1C_a = $	324,126	$1-K_2K_3$ =	.8485

$Q_s=I_{ar}/K_1C_a=$ .1518

$Q_{Bn}=B_n/K_1C_a=$ 1.0426

$Q_{Bf}=B_f/K_1C_a=$ .4190

$Q'_s=Q_s-K_2K_3Q_{Bf}$ = .0883

$Q_c=0.707\ (Q_s+Q_{Bn}+Q_{Bf}(1-K_2K_3))=$ 1.0957

TABLE NO. 6-f
HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Roy-Harlem Route County Fergus, Blaine

Description of Project

Highway number Highway System Primary

Length 138.5 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = $	45,970	K_1 =	1.0000
C_a = $	387,960	K_2 =	.6333
F_n = $	387,320	K_3 =	.2000
B_f = $	150,360	K_2K_3 =	.1266
K_1C_a = $	387,960	$1-K_2K_3$ =	.8734

$Q_s = I_{ar}/K_1C_a =$ .1185

$Q_{Bn} = B_n/K_1C_a =$ .9983

$Q_{Bf} = B_f/K_1C_a =$ .3876

$Q'_s = Q_s - K_2K_3Q_{Bf} =$ .0694

$Q_c = 0.707\ (Q_s + Q_{Bn} + Q_{Bf}(1-K_2K_3)) =$ 1.0288

TABLE NO. 6-g

HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Winifred-Malta Route County Fergus, Phillips

Description of Project

Highway number Highway System Primary

Length 147.5 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

I_{ar} = \$ 68,453

C_a = \$ 410,957

B_n = \$ 364,390

B_f = \$ 141,479

K_1C_a = \$ 410,957

K_1 = 1.0000

K_2 = .6253

K_3 = .2000

K_2K_3 = .1251

$1-K_2K_3$ = .8749

$Q_s=I_{ar}/K_1C_a=$ .1665

$Q_{Bn}=B_n/K_1C_a=$ .8866

$Q_{Bf}=B_f/K_1C_a=$ .3442

$Q'_s=Q_s-K_2K_3Q_{Bf}$ = .1235

$Q_c=0.707\ (Q_s+Q_{Bn}+Q_{Bf}(1-K_2K_3))=$ .9574

TABLE NO. 6-h
HIGHWAY PROJECT ANALYSIS

Location of Project Lewistown-Winifred-Harlem Route County Fergus, Blaine

Description of Project

Highway number Highway System Primary

Length 145.0 miles Date of analysis May 16, 1949

Analysis made by H. T. Buswell Checked by

$I_{ar} = \$\ 67{,}335$ $K_1 = 1.0000$

$C_a = \$\ 450{,}403$ $K_2 = .5545$

$B_n = \$\ 380{,}306$ $K_3 = .2000$

$B_f = \$\ 150{,}380$ $K_2K_3 = .1109$

$K_1C_a = \$\ 450{,}403$ $1-K_2K_3 = .8891$

$Q_s = I_{ar}/K_1C_a =$ .1495

$Q_{Bn} = B_n/K_1C_a =$ .8443

$Q_{Bf} = B_f/K_1C_a =$ .3338

$Q'_s = Q_s - K_2K_3Q_{Bf} =$ .1125

$Q_c = 0.707\ (Q_s + Q_{Bn} + Q_{Bf}(1-K_2K_3)) =$ .9124